B.R.R. No 117 by of 1939.

PUNJAB CIVIL SECRETARIAT
27 FEB. 1939
LAHORE.

Madras Fisheries Department

ADMINISTRATION REPORT

FOR THE YEAR 1937–38

BY
DIWAN BAHADUR DR. B. SUNDARA RAJ, M.A., PH.D.
Director of Fisheries

G1(26)
14828
G-1(26)
1939
14828

MADRAS
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS
PRICE, 8 *annas*]
1939

CONTENTS

	PAGE
INTRODUCTION	

PART I.

ACTIVITIES OF THE DEPARTMENT.

I MARINE FISHERIES—

A. Research—

(a) Scientific Research—

(i) West Hill Biological Station, Calicut	4
(ii) Krusadai Biological Station	11
(iii) Vizagapatam Laboratory	17
(iv) Marine Aquarium Laboratory	17

(b) Technological Research—

(i) Fishing methods	17
(ii) Tanur Experimental Station	17

B. Administration—

(a) Public Fish-curing yards—

(i) East Coast (Northern section)	26
(ii) Do. (Central section)	28
(iii) Do. (Southern section)	29
(iv) West Coast	31
(b) Private Oil and Guano Factories	35

II MINOR MARINE AND ESTUARINE FISHERIES—

A. Prawns	35

B. Edible Oysters—

(i) Oyster research	35
(ii) Oyster supply	36
(iii) Shell leases	36

III INLAND FISHERIES—

A. Research—

(i) Research on Rural Pisciculture	37
(ii) Deep-water tank fishing experiments	37
(iii) Fish breeding	38

B. Administration—

(i) Fish farms	40
(ii) Mettur Project Fish Farm	44
(iii) Periyar scheme	45
(iv) Ganjam Tank Stocking scheme	45
(v) Nilgiri Fisheries	46
(vi) Piscicultural survey, Tinnevelly district	46
(vii) Government House Ponds, Guindy	46
(viii) Fishing in Kodi tank	47

PAGE

III INLAND FISHERIES—*cont.*

C. Stocking operations and results—

(i) Stocking operations 47

(ii) Sale of fisheries 47

(iii) Disposal of fisheries by private tenders 47

(iv) Do. by closed tenders 48

(v) Do. to co-operative societies 48

(vi) Fishery rentals 49

IV CROWN MONOPOLIES (PEARL AND CHANK FISHERIES)—

A. Research—

(i) Pearl oyster 49

(ii) Chank-marking experiments 49

(iii) Diving experiments 50

B. Administration—

(i) Inspection of pearl banks 50

(ii) Tinnevelly Chank Fishery 51

(iii) Other Chank Fisheries 53

V BIOLOGICAL SPECIMEN SUPPLY 53

VI ANTI-MALARIAL WORK 54

VII SOCIO-ECONOMIC WORK—

A. Education—

(i) West Coast—

(*a*) Fisheries Training Institute, Calicut 55

(*b*) Village schools 55

(ii) East Coast—Fisheries Technological Institute, Tuticorin 56

(iii) Marine Aquarium 56

B. Co-operative Societies—

(i) West Coast—

(*a*) South Kanara 58

(*b*) Malabar 61

(*c*) Blangad Purchase and Sale Society 63

(ii) East Coast 65

C. Other Socio-Economic Work—

(i) West Coast 65

(ii) East Coast 66

(iii) Provision of marketing facilities for curers 66

VIII PROPAGANDA—

A. Rural Pisciculture 67

B Exhibition 69

IX FISHERY LEGISLATION—

(i) Licences for fixed engines 69

(ii) Stake-net Fishing 70

(iii) Nilgiri Fishing Rules 70

X PUBLICATIONS 70

PAGE

PART II.

FINANCE.

Summary of Financial Results 71

PART III.

STAFF AND EQUIPMENT.

I BIOLOGICAL—
A. Assistant Director (Biology) 71
B. Research stations 71

II TECHNOLOGICAL—
Tanur Experimental Station 72

III EDUCATIONAL—
(i) Fishery Elementary Schools 72
(ii) Co-operative Societies 73

IV NAUTICAL—
(i) "Lady Nicholson" 73
(ii) "Sea Scout" 73
(iii) "Leverett" 73
(iv) "Pearl" 73
(v) Yorkshire Coble "Pinctada" 73

V ADMINISTRATIVE—
A. Director's office 74
B. East Coast (Northern section) 74
C. Do. (Central section) 74
D. Do. (Southern section) 74
E. West Coast 75

APPENDICES.

I Chart 76
II Chank-marking experiments 77
III Statement of Expenditure and Revenue of the Fisheries Department for 1937–38. 78

FISHERIES DEPARTMENT.

Subject.

Fisheries—Administration Report—1937–38—Submission of.

Ref. No. 1952-G/38.

Station, MADRAS. *Dated the* 31*st October* 1938.

From

DIWAN BAHADUR DR. B. SUNDARA RAJ, M.A., PH.D.,
Director of Fisheries,
Madras.

To

THE SECRETARY TO THE GOVERNMENT OF MADRAS,
DEVELOPMENT DEPARTMENT.

SIR,

I have the honour to submit the Administration Report of the Fisheries Department for the year ending 30th June 1938.

INTRODUCTION.

2. The year under report is noteworthy since the Jubilee Session of the Indian Science Congress held jointly with the British Association brought to India last January eminent workers in every branch of Science. The need to develop Fisheries as an important food industry in the country was emphasized in the Zoology section and Professor W. M. Tattersall of the University of Wales moved a resolution stressing the need for an All-India Institute for research on the major problems of Indian Fisheries. Two committees have

been formed for drawing up proposals, one in India of which I have been elected Chairman, and the other in England of which Professor Tattersall is the elected President. Following this at the recent sessions of the British Association at Cambridge in August 1938 Dr. S. W. Kemp, F.R.S., Director, Marine Biologial Station, Plymouth, further emphasized the urgent need to develop Indian fisheries and deplored the general apathy of Indian Governments in this respect. It is, therefore, gratifying to note the efforts that have been made during the year to revive deep sea fishing research in Madras begun by the "Lady Goschen." Proposals to charter a boat capable of employing all known methods of sea fishing in order to test their suitability for Indian conditions have reached an advanced stage. Unfortunately other plans for advance have had to be kept in abeyance pending a decision on the scheme of retrenchment and reorganization referred to in last year's report, in spite of the fact that the average surplus revenues of the department during the year amounted to Rs. 12,074 excluding the expenditure on education.

3. Remarkable advance has been made with reference to Pearl Fishery research during the year. Apart from the continued prosperity of the pearl oysters in the Krusadai pearl farm, establishing beyond the shadow of a doubt the practicability of keeping and breeding the Indian pearl oyster (*Pinctada vulgaris*) in captivity, a great impetus to this research was given by the discovery of unexpected spat falls in very shallow water adjacent to the farm in places where oyster beds have never been known before. A bed of young oysters one-twelfth square mile in extent 9 miles south of the Krusadai farm was found in March and 302 oysters collected therefrom were transferred to the collection at the Krusadai pearl farm. Since the close of the year a much larger bed, two square miles in area, has been discovered in Palk Bay north of the Krusadai pearl farm. Here again as the oysters are in very unsuitable ground and are rapidly dying out, they have to be fished and transferred to the Krusadai farm if they are to be saved. Twenty-one thousand one hundred and forty-nine oysters have so far been added to the pearl farm and the fishery is continuing. This large addition to the stock it is hoped will now enable the department to commence pearl farming on an extensive scale and provide sufficient raw material for initiating experiments in the culture-pearl industry.

4. In Inland fishery research, the chief cause for the failure of *Catla* and *Gourami* to thrive in the Ippur farm has been traced to the subsoil salinity which supervenes in late summer. This

knowledge will now enable the department to prevent avoidable waste of effort and money in tank stocking. Though catla farming has given surprisingly good results all over the Presidency, Catla have remained mysteriously stunted in growth in certain tanks and wells on the sea board of the Chingleput and Nellore districts. For instance in the Baba Taj Nursery pond, Saidapet, fry 2″–4″ have grown only to 9″—10″ from September 1935 to September 1938. Likewise Gourami which breeds freely everywhere has failed to multiply in some of the coastal waters of the Nellore district. The determination of the causes has been the subject of long and patient investigation at Ippur. It now seems certain that the temporary summer brackishness of the water is the root cause of the failure. Food fish more tolerant of brackish water will in future form the subject of cultural experiments at Ippur.

Perhaps even more important economically is the direct proof that has been obtained during the year of the breeding of Catla in the Cauvery river. A large spawning female specimen was netted in the act at the Hoginakal falls during my inspection on 18th July 1938, so near to the falls that the place was not approachable even by a motor boat. This disposes of the doubt whether Catla is able to live or breed in rapid currents in large rivers.

5. The most important feature of the year's technological research is the continuance of the vitamin ' A ' survey of fish oils which has led to the discovery of four more Indian fish with 3 to 19 times the vitamin potency of cod liver oil. Sufficient knowledge having been gained of the vitamin ' A ' contents of several common fish, a scheme to popularise the manufacture of medicinal fish oil in fishing villages as a cottage industry was formulated during the year at the instance of Government.

Another noteworthy result of the year's research on fish oils which promises to confer great economic benefits on the West Coast Oil industry is the confirmation of the presence of vitamin ' A ' in appreciable amounts in Malabar sardine (S. *longiceps*) first detected in 1933. This is the commonest and cheapest fish oil of the West Coast and the existence of vitamin ' A ' in the oil now definitely proved is of great commercial importance as the oil can be utilised for food and medicinal purposes by blending if necessary with shark and other liver oils of very high vitamin content.

6. The fishing season on both the East and West Coasts was worse than last year and caused a further fall in the transactions of fish-curing yards. A more abundant rainfall and the close attention paid to inland fisheries especially those of the Cauvery where fish rents have been steadily declining since the construction of the

Mettur Dam resulted in an appreciable increase in revenue from this source, the Cauvery rentals alone bringing in nearly Rs. 4,000 more than last year.

7. At the request of the Registrar of Co-operative Societies a detailed scheme for further encouraging co-operation among the fishermen in the light of past experience was drawn up and is under the consideration of the Registrar. The chief recommendations are (1) the appointment of group clerks, for attending to the clerical and collection work of the societies, (2) extension of credit facilities, and (3) appointment of an officer to enquire into the general indebtedness of the fishermen.

PART I.

ACTIVITIES OF THE DEPARTMENT.

I. MARINE FISHERIES.

A. RESEARCH.

(a) Scientific Research.

8. (i) WEST HILL BIOLOGICAL STATION, CALICUT—*Plankton Investigation.*—Surface plankton was collected on 138 days during the year as against 137 days last year as follows :—

108 hauls in 4 to 6 fathoms off West Hill,
2 hauls in 6 to 7 fathoms off Chaliyam,
20 hauls in 10 to 17 fathoms off Tanur, and
8 hauls in 7 to 13 fathoms off Calicut.

The plankton was studied with special reference to fish eggs and larvæ which were isolated for detailed study. A large collection of clupeoid eggs including a few oil-sardine eggs was made.

9. The quantitative study of plankton was continued on the usual lines. The plankton was at its maximum in September and at its minimum in January. Last year the maximum was in August and the minimum in October. The graph appended (Appendix No. I) shows the variations in the quantity of plankton for the last five years. As usual the bulk of the plankton consisted of copepods which occurred throughout the year.

10. *Phyto-plankton.*—The same diatoms which were most abundant in the plankton last year, viz., *Coscinodiscus* and *Fragilaria*, were abundant this year also. The species of *Coscinodiscus* present were *C. gigas var. dioramma*, *C. oculuo-iridis*, *C. jonesianus*, *C. joneschii* and *C. radiatus*.

11. The table below gives the dominant groups of diatoms and their seasonal occurrence :—

Genus.	Occurrence.
Coscinodiscus ..	Present throughout the year ; abundant from August to December, and from March to May and in fewer numbers during the other months of the year.
Fragilaria ..	Abundant in August, September and March and in small numbers during April and May.
Chœtoceras ..	Abundant in August, September, January and February and in small numbers during October, November, December, March and May.
Biddulphia ..	Rare throughout the year.
Pleurosigma ..	Abundant in November and rare in August, September, December and January.
Rhizosolenia ..	Fairly common in January and May and few in December.
Trichodesmium ..	Rare in March and abundant during the rest of the year.

12. *Zoo-plankton.*—As usual zoo-plankton was more abundant than phyto-plankton. Copepods chiefly represented by *Acartia erythrœ*, *A. centrura*, *A. spinicauda*, *Paracalanus sp.*, *Euterpina sp.* *Oithona plumifera*, *Oithona sp.*, *Temora turbinata*, *Pseudodiaptomus spp.*, *Acrocalanus sp.* and *Centropagus sp.* were abundant.

13. The relative abundance of the dominant organisms in the different months of the year is shown below :—

Genus.	Occurrence.
Copepods ..	Abundant in October, November, January, February and May. Less so in September, December, March and April and still less in August.
Noctiluca ..	Abundant in August and September and in small numbers in October and November and from January to May.
Evadne	Abundant in September, less so in October and in small numbers throughout the other months of the year.
Larval bivalves ..	Abundant in November and December, less so in October and January and in small numbers during the rest of the year.

Genus.	Occurrence
Daphnids ..	In small numbers throughout the year except in April.
Sagitta	Fairly abundant in December, March and May, less so in September, October, February and April, and in small numbers in August, November and January.
Ctenophores ..	Fairly abundant in April, less so in October and December and in small numbers in September, January and February.
Medusoids ..	In small numbers throughout the year except in August.
Nauplius larvæ ..	Rare throughout the year.
Leucifer	Common in December, January, February and May, and in fair numbers from August to November and in March and April.
Appendicularia ..	In fair numbers during October, November, February and May and rare in September, January, March and April.
Radiolarians *Acanthometron sp.*	Fairly abundant in November and rare in April and May.
Fish eggs and larvæ.	Fairly abundant in September, less so in October and November and rare during the remaining months of the year.

14. *Sardine investigation.*—Oil-sardine were unfortunately again scarce this year. Random samples of oil-sardine were procured and studied whenever available locally and from neighbouring places such as Quilandi, Beypore, Tanur, etc. A few oil-sardine with fairly well-developed gonads appeared off West Hill in the first week of July 1937, and continued to figure in the catches throughout July and August. The development of the gonads was very carefully watched. The ova were very nearly transparent, i.e., ready for spawning, in a few specimens examined on 31st August 1937. In September mature fish began to be scarce, being available only on three days. A few specimens with almost transparent ova were present in the sample examined on 8th September 1937. Twenty-five per cent of the specimens examined on 22nd September were spent fish and nearly seventy per cent of those examined on 30th September were such. In October adult oil-sardine were available only on two days, 5th and 9th. The samples examined on these two days consisted entirely of fish which had already spawned. This shows that this year as in 1934 the oil-sardine off Calicut spawned in the latter half of September and early part of October. Two samples of adult oil-sardine obtained in November (19th and 25th) consisted of specimens which had already spawned and were

recovering (recovering spents). In December mature oil-sardine were obtained on three days (8th, 10th and 13th), all of which were 'recovering spents.' Thereafter full-grown specimens were not available at all. One sample of oil-sardine from a catch made off Quilandi on 30th November was received from the Quilandi fish-curing yard. This sample proved of special interest as it contained a number of specimens with their gonads not completely spent. Such specimens were never seen in November in previous years. This shows that the spawning season of the oil-sardine may extend over several months or that there are a few late spawners. The question can be settled only by further observation.

15. A few eggs of the oil-sardine were obtained from the inshore plankton off West-hill on 28th September 1937. These eggs were in a more advanced stage of development than those obtained in September 1934. Moreover they were collected in the morning. The eggs must have drifted into this zone from some adjoining spawning ground off-shore. In 1934 at Quilandi they were collected off-shore in the night (vide paragraph 11, Administration Report, 1934–35).

16. The specially designed departmental seine net (Kolli valai) for collecting sardine of all sizes could not be used this year owing to the scarcity of oil-sardine.

17. The size, sex, stomach contents, condition of gonads and fat of 2,327 specimens of oil-sardine were recorded from the catches sampled during the year. The size frequency of the samples measured was as follows :—

Length overall.	July.	August.	September.	October.	November.	December.	January.	Total.
9 cm. ..	..	..	63	..	..	..	..	63
10 cm. ..	..	1	37	..	5	..	..	43
11 cm. ..	..	..	27	1	48	1	..	77
12 cm. ..	..	18	79	28	40	22	5	192
13 cm. ..	..	29	51	148	50	15	25	318
14 cm. ..	..	2	12	54	142	95	16	321
15 cm. ..	4	..	10	6	62	104	27	213
16 cm. ..	92	52	23	12	8	31	5	223
17 cm. ..	130	109	21	14	54	128	16	472
18 cm. ..	93	79	9	21	54	43	5	304
19 cm. ..	17	21	1	6	8	11	1	65
20 cm. ..	18	8	..	4	6	..	..	36
Total ..	354	319	333	294	477	450	100	2,327

The size of the fish this year ranged from 9 cm. to 20 cm. in length overall; 17 cm. was the size best represented in the catches. There was a good catch of immature oil-sardine measuring from 11 cm. to 14 cm. during November 1937. These fish were very rich in oil.

18. *Food of the oil-sardine.*—An analysis of the stomach contents showed that the following organisms formed the food of the fish :—

Copepods (*Paracalanus spp., Acartia spp., Oithona sp.* and *Euterpina sp.*).
Peridinians (*P. depressum, P. ovatum and P. occanicum*).
Coscinodiscus (*C. oculuo-iridis, C. gigas var diaromma, C. jonesianus, C. joneschii* and *C. radiatus.*
Fragilaria sp.
Ceratium (*C. massiliense, C. tripos* and *C. furca*).
Larval bivalves.
Biddulphia (*B. granulata* and *B. mobiliense*).
Dinophisis (*D. homunculus* and *D miles*).
Nitzchia.
Asterionella japonica.
Talassiothrix nitzchioides.
Pleurosigma.
Planktoniella.
Nauplius larvæ.

Sand grains were found in the stomach of a few specimens belonging to three samples, indicating bottom feeding habits, the first taken from a catch made off West-hill close to the shore on 1st September 1937, second from off Calicut in four fathoms on 10th December 1937, and the third from off Quilandi in three fathoms on 30th November 1937.

19. *Scale readings.*—The examination of the scales was continued, but without decisive results.

20. *Races of oil-sardine.*—A collection of oil-sardine received from Aden towards the end of last year is being examined in detail for the study of racial characters.

21. *Mackerel investigation.*—The mackerel fishery was a failure this year. The fish were available for study on a few days only. Sixteen samples of mackerel consisting of 192 specimens were examined during the year, as against 1,107 last year. As will be seen from the table below, they ranged from 11 cm. to 25 cm. in length overall, but the majority measured from 22 cm. to 23 cm., 22 cm. fish being most dominant as last year :—

Length overall.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	May.	Total.
11 cm.	1	..	..	..	..	..	..	..	..	..	..	1
12 cm.	3	..	..	..	..	..	..	..	..	..	..	3
13 cm.	..	..	..	..	..	..	..	..	..	..	..	..
14 cm.	..	..	..	..	..	..	..	..	..	..	..	..
15 cm.	..	..	..	..	..	..	..	..	..	..	..	..
16 cm.	..	5	..	..	..	..	..	..	..	..	..	5
17 cm.	..	11	..	..	..	..	..	..	..	..	..	11
18 cm.	..	9	..	..	..	..	..	..	..	..	..	9
19 cm.	..	..	..	..	..	..	..	..	..	..	..	..
20 cm.	..	3	..	6	..	..	..	..	..	2	..	11
21 cm.	1	8	1	11	..	..	..	..	..	8	1	30
22 cm.	6	..	16	15	..	..	..	..	..	17	3	57
23 cm.	4	..	35	..	..	..	..	3	..	5	2	49
24 cm.	1	..	11	..	..	..	..	1	..	..	2	15
25 cm.	..	..	1	..	..	..	..	..	..	..	..	1
Total ..	16	36	64	32	..	..	..	4	..	32	8	192

Mackerel appeared off Calicut for the first time this year on 8th July. A sample from the small catch made had gonads in an advanced stage of development. Later mackerel did not appear at all till 29th July, when a few immature fish were caught along with oil-sardine. In August mackerel appeared only on two days. Nearly seventy per cent of the mature fish caught during the month were fish which had spawned several weeks ago (probably in June). The rest, however, had their gonads well developed. Sixty per cent of a sample examined on 4th September consisted of spent fish, while the samples examined on 7th September and later consisted entirely of spent and partly spent fish. The mackerel caught in October were all ' recovering spents.' Later the fish did not appear at all till about the end of February 1938, and on a few days in April and May and consisted of recovering spents.

22. The above observations roughly show that the spawning of mackerel begins sometime about June and continues to about the end of September, rather a long period.

23. Because of the scarcity of mackerel, it was again not possible to secure spawning fish and carry out artificial fertilization of the ova to study the early development. Last year, spent fish were not obtained at all; we were consequently led to suppose that mackerel either did not spawn in in-shore waters frequented by local fishermen or after spawning at night left the coast for the deep sea (vide paragraph 26 of last year's report). But this year spent fish have been caught from August onwards. Therefore it is clear that the mackerel do not forsake the coast immediately after spawning, and that their spawning grounds are not very far from the coast.

24. *Parasitological work.*—Work on the internal parasites of the mackerel was commenced during the year.

25. *Food of the mackerel.*—The stomach contents of mackerel were examined in detail and the following organisms were found :—

- Copepods (*Paracalnus spp.*, *Euterpina spp.*, *Acratia spp.* and *Oithona sp.*).
- Coscinodiscus (*C. jonesianus*, *C. oculuo-iridis*, *C. gigas var. dioramma and C. joneschii*).
- Peridinians (*P. depressum* and *P. ovatum*).
- Larval bivalves.
- *Evadne.*
- *Fragilaria.*
- *Ceratium* (*C. tripos and C. missiliense*).
- *Thalassiothrix nitzchioides.*
- *Nitzchia.*
- *Asterionella japonica.*

Rhizosolenia.
Pleurosigma.
Dinophysis homunculus.
Biddulphia granulata.
Larval prawns.
Tintinnus.
Planktoniella.
Ceratulina.
Fish eggs.

26. *Other fishery investigations.*—In addition to the detailed research on oil-sardine and mackerel, ecological studies on other shoaling fishes of the coast such as *Sardinella brachysoma, Sardinella fimbriata, leiognathus, bindus, Cynoglossus semifasciatus, Selar crumenopthalmus, Kowala thoracata, Lactarius lactarius* and *Trichiurus savala* were continued as usual. In all 1,141 specimens were studied. The Research Assistant has submitted a paper " On the Food and Sprawning Season of *Sardinella brachsoma* ' to the forthcoming session of the Indian Science Congress. The observations made on *Cynoglossus semifasciatus* (manthal) show that the spawning season of this fish is somewhere about the end of February.

27. The usual collection and identification of the important food fishes of the coast were continued and the data recorded in the fish register maintained for the purpose.

28. The proper type of tags for conducting fish-marking experiments have not yet been obtained. The matter is under correspondence with firms in America. For the study of migration and growth of shoaling fishes such as herring, tags have been successfully employed in recent years. The recovery of tagged specimens is indispensable for this type of research and is expected to present great difficulties in India where the fishermen are ignorant and illiterate and the inspecting staff meagre. But even the recovery of a few fish brought to the fish-curing yards will, it is hoped, throw very considerable light on the migration, rate of growth and duration of life of the two most economically important west coast fish, sardine and mackerel.

29. *Hydrographical and weather records.*—The usual daily records of surface temperature, specific gravity, salinity and hydrogen-ion concentration (pH) of sea water, maximum and minimum temperature and humidity of air, the condition of the sea, weather and sky were made. The surface temperature of the sea reached its maximum of 31°C on 30th March and its minimum of 23·8°C on 12th July 1937 and 30th June 1938. The salinity of sea-water was highest on 15th January, when it was 39·74 and lowest, namely,

15·37, on 20th June 1938. The pH value ranged from 8.1 to 8.4 and specific gravity from 1·0117 to 1·030.

30. *Museum.*—The museum specimens in the collection of the Fisheries Training Institute were transferred to the West Hill Biological Station, and the collection has now been arranged in a museum room which it was possible to set apart, the West Hill building having been wholly assigned to the Bioligical Station this year. [G.O. Ms. No. 1807, Public Works, dated 22nd August 1938.]

31. *Visitors.*—The Hon'ble the Minister for Industries and Labour, Sri V. V. Giri, visited the station on the 10th October 1937, and the Hon'ble the Minister for Agriculture and Rural Development, Sri V. I. Muniswami Pillai, visited the station on 27th November 1937.

32. (ii) KRUSADAI BIOLOGICAL STATION—*Plankton investigation.*—Inshore plankton was collected from the Kundugal channel on 64 days and offshore plankton on 16 days (8 collections north of Rameswaram Island in the Palk Bay, and the rest south of Krusadai Island in the Gulf of Mannar). The plankton net did not suffer damage this year as it was towed with the current.

33. *Phyto-plankton.*—In the inshore plankton, diatoms were common during July, August, February, March and June and less common in the other months. Among the diatoms, the following were dominant in the plankton in the months noted against each :—

Trichodesmium ..	July, January and March.
Chœtoceras ..	July, February, March and June.
Rhizosolenia ..	July, August, December, March and April.
Coscinodiscus ..	December, February and March.
Thalassiothrix ..	July, December and June.
Buddulphia ..	February and March.

34. The following diatoms were also found but were rare :— *Nitzchia*, *Navicula*, *Bellerochea*, *Bacteriastrum*, *Bacillaria* and *Pleurosigma*.

35. *Zoo-plankton.*—The following were dominant in the months noted against each :—

Radiolarians ..	July, August, February, March and June.
Copepods and crustacean larvæ.	September. October, December and January to March.
Leucifer	October, December and March.
Larval gastropods and bivalves.	August, October, February and March.
Pteropoda (*Creseis acicula*).	March.
Sagitta	December and March.
Ctenophores(*Pleurobrachia globossa*).	November, December and January.
Noctiluca	January.
Ceratium	March.

36. *Research on East Coast food fishes.*—The identification and study of the local food fishes was continued as usual.

37. Ecological studies on the following fishes were continued :—

"Thondan" (*Dussumieria hasseltii*).
"Kuthippu" (*Lactarius lactarius*).
"Murrel" (*Hemirhamphus georgii*).

In all 276 specimens were examined. "Murrel" and "Thondan" are plankton feeders, as their food consisted of copepods and pteropods (*Creseis* sp.). The eggs of "Thondan" were in the early stages of maturation in March and in more or less advanced stages by May. The actual spawning season remains to be ascertained. *Lactarius lactarius*, judged by their stomach contents, seem to feed on plankton animals as well as on small fish. The ovaries of many specimens of *Lactarius* were immature in June and July.

38. Dr. Devanesan's paper "On the spawning habits the artificial fertilization and hatching of the eggs of "*Hemiramphus georgii*" read at the Twelfth Session of the International Science Congress, 1935, was published in its Proceedings, Volume III (1937), pages 2175–2181.

39. *Hydrographical and Meteorological data.*—These were recorded as usual. In the Kundugal channel the maximum surface temperature of sea-water was 31·2°C. on 27th April 1938 as against 30·4°C. on 28th April 1937, and the minimum temperature was 23·2°C. on 29th November 1937 as against 24·3°C. on 9th January 1937. The highest salinity was on 20th September 1937 (40·64) and the lowest (29) on 6th December 1937. The pH value ranged from 8·3 to 8·7 and the specific gravity from 1·022 to 1·0252.

40. *Research on pearl oysters.*—The oysters in the Park have continued to thrive and breed. There were 346 oysters at the beginning of the year. The number of casualties this year was 135 and the percentage of mortality about 36 per cent as against 29 per cent in the previous year. The increase in casualty is attributed to bad weather. The spat fall, however, has been satisfactory and 122 spat were collected this year. Forty-nine very young spat of the season have been under observation since 12th May 1938. All the oysters under observation continued to be measured and weighed at regular intervals. Bamboo thattis as spat collectors were again tried but proved useless for the purpose. The records of length and weight measurements of oysterlings from 9 mm. kept under observation in the cages from 1935 are under scrutiny for determining methods of ascertaining age and rate of growth in the Indian pearl oyster. Some very important and useful results are emerging from the work.

41. *Abnormalities.*—Melanic as well as pigmentless examples were noticed among young pearl oysters born in the cages. In some cases the oysters turned yellowish green as growth advanced.

42. *Extension of Pearl Oyster Farm.*—The experiments hitherto conducted were on a very limited laboratory scale with a few hundred oysters. The special cages with cubicles for the study of individual oysters were expensive but necessary for ascertaining the rate of growth, age, and mortality of the pearl oyster. During the year unique opportunities for extending the pearl farm to the proportions of a small experimental farm were afforded by the unexpected discovery of a small spat fall opposite to Vedalai in the Gulf of Mannar in $1\frac{3}{4}$ to $2\frac{1}{4}$ fathoms within 9 miles south of the Krusadai pearl farm in March 1938. A further spat fall of larger proportions has been discovered since the close of the year off Pudupatnam, north of the Krusadai pearl farm in the Palk Bay. Thousands of oysters secured in these areas have been added to the collection. The cheapest and the most efficient method of keeping the oysters in captivity has been devised on the model of the Japanese pearl farms. The casuarina plantation started on the Island in 1933 is now yielding timber of sufficient size for the rafts and it is hoped to extend the farm to the utmost extent without inter fering with navigation.

43. The possibility of the two spat falls north and south of the Krusadai pearl farm having emanated from the stock maintained in the Krusadai farm is under investigation. Samples of the oysters fished have been identified as *Pinctada vulgaris*, the common Gulf of Mannar oysters, by Colonel Winckworth, and as *P. chemnitzi*, a closely allied form considered by many as only a variety of *P. vulgaris* by Doctor Baini Prashad, the Director of the Indian Museum. No pearl oysters have at any time been found in the two areas mentioned above in the whole history of pearl fisheries. Their occurrence this year therefore is a matter of great significance and demands the most careful study.

44. An inspection of the Palk Bay shows that hydrographical conditions were suitable for the occurrence of spat falls. On account of the heavy rainfall in the Tanjore and Ramnad coasts during the last two or three years, the fisheries of the coast have undergone the cycle of changes to which I have already referred to in paragraph 206 of my administration report for the year 1931–32. The large influx of fresh water brought down by the rivers which has led to the destruction of the extensive beds of sea weeds (*Cymodocea isoetifolia, C. serrulata and Halophila ovata*) in the bay has led to the resuscitation of shell beds. That such changes, as anticipated

in 1932, would lead also to spat falls of pearl oysters has been proved by the experience of this year.

45. *Research on chank fisheries.*—The usual examination of the commercial catches made by the lessee of the Ramnad chank fisheries and recording the measurements of random samples of shells from his catches was continued.

46. *Museum.*—During Doctor Gravely's term of office the collection of specimens on the Island received considerable attention. Great improvement has been effected in the Museum Catalogue as well as in the additions to and arangement of the exhibits. All efforts are being made to make the collection as complete as possible.

47. A collection of 50 named shells with three varieties of *Favia speciosa* presented by Mr. Crichton of the National Bank of India, Madras, was added in a suitable shell cabinet.

48. The following specimens were received from Doctor Gravely and added to the Museum :—

Crustacea ..	*Zozymus aeneus*, Linnaeus. *Pinuotheres ridgewayi* Southwell *Petrolithistes militaria*, Heller. *Leucosia craniolaris*, Linn. *Menaethius monoceras*, Lat *Ligia exotica* Roax.
Chætopoda (*Polychœta*).	*Salmacina dysteri* Huxley. *Phyllochætopterus elioti*, Crossland. *Spirorbis foraminosus*, Moore and Busk.
Gephyrea ..	*Dendrostoma signifer*, Selenka & de Man.
Polyzoa	*Cellaria* sp.
Mollusca	*Scintilla timorensis*, Deshayes.
Hydrozoa ..	*Bimeria vestita*, Wright. *Orthopyxis everta*, Clark. *Diphasia digitalis* Busk. *Pasythea quadridentata*, Ellis and Sol
Scyphzoa ..	*Crambionella orsini*, vanhoffen.
Alcyonaria ..	*Xenia nana* form Y. *Sclerophytum herdmani*, Pratt.
Zoantharia ..	*Gemmaria multisulcata*. *Phellia* sp. *Corynactis* sp. *Favia valenciennessii*, M. Edw. *Psammocora haimiana*, M. Edw. and Haime. *Goniopora* sp.

49. During the visit of Professor Tattersall of the University of Wales, the opportunity was taken to add the following crustaceans duly identified by him to the Museum collections :—

From Krusadai plankton.	*Acetes japonicus*, Kish. *Leucifer hanseni*, Nobili. *Leptochela aculeocaudata*, Paulson. *Rhopalophthalmus egregius*, Hansen.
From Kilakarai reef.	*Gonodactylus chiragra*, Fabr.

50. The other accessions to the museum made by the staff were *Pallene* sp., *Bolina* sp., *Iphione muricata* (Savigny), *Echiurus* sp. (newly recorded), and *Phyllosoma larvæ*.

51. *Coconut and casuarina plantation.*—As the lessee failed to pay the rental of Rs. 310 for the second year of the lease, the lease was cancelled. One lot of 190 casuarina trees suitable for oars were sold for Rs. 100 during the year. Ordinary shade trees and palmyra to counteract sand dune formation were planted.

52. *Visitors.*—The following professors and students visited the station :—

Lecturer Dr. Viswanath of the Government College, Lahore (from 11th July 1937 to 3rd September 1937).

Additional Professor A. Ramanathan of the Presidency College, Madras, with 15 students (from 30th September to 4th October 1937).

Professor A. Narayana Rao of the Central College, Bangalore, on 6th October 1937.

Professor L. S. Ramaswami of the Central College, Bangalore, on 7th October 1937.

Dr. A. Sampathkumar, Assistant Professor L. Narayana Rao, Lecturer S. B. Kausik, with 16 B.Sc. (Hons.) students of the Central College, Bangalore, and Demonstrator Miss B. H. Annapurni of the Women's Intermediate College, Bangalore, from 8th October to 12th October 1937.

Dr. M. O. Parthasarathy Ayyangar, Director, University Botanical Laboratory, Madras, from 8th to 12th October 1937 and from 20th to 22nd January 1938.

Assistant Professor John E. Chelladurai of the Science College, Trivandrum, with 11 Senior Zoology students from 17th to 21st October 1937.

Professor P. W. Gideon of the Karnataka College, Dharwar, from 23rd to 25th October 1937.

Lecturer R. V. Seshaiya of the Annamalai Universitv with 19 students on 26th December 1937.

Assistant Professor M. Ekambaranathan, of the Presidency College, Madras, with 9 students from 4th to 7th January 1938.

Assistant Professor R. V. Narayanaswami of the Presidency College, with 10 students from 7th to 9th January 1938.

Assistant Lecturer K. K. Joseph, of the American College, Madura, with 23 students from 14th to 15th January 1938.

Professor and Mrs. F. E. Fritch, F.R.S. of Queen Mary's College, London, from 20th to 22nd January 1938.

Professor and Mrs. W. M. Tattersall, of the University of Wales, from 20th January to 8th February 1938.

Dr. D. B. Krishna Rao, University Research Scholar, Botanical Laboratory, Madras, from 25th to 27th March and from 29th March to 1st April 1938.

53. A sum of Rs. 292–9–3 was collected as fees as against Rs. 59–12–0 last year. Five cases of specimens were sent to Professor Tattersall and rare and named specimens are expected back from him for the museum.

54. *Discovery of Coeloplana.*—Professor and Mrs. Tattersall, of the University of Wales, delegates to the Silver Jubilee session of the Indian Science Congress held in Calcutta in January 1938, visited the Biological station for a study of the Fauna of Krusadai Island (20th January to 8th February 1938). Among the many specimens of interest collected by them was a *Coeloplana*, from the sea weed *Halimeda opuntia*, a rare animal of great scientific interest*. The work of identifying and describing the animal was entrusted by Professor Tattersall to the staff of the Research station. A preliminary note on the animal has been submitted to the forthcoming session of the Indian Science Congress (January 1939) by the Assistant Director (Biology) and the Research Assistant.

55. *Trawler collections.*—A large collection of Alcyonarians and Antipatharians mostly made by the trawler '*Lady Goschen*' was sent to specialists through the British Museum (Natural History) for identification.

56. The inshore plankton collections, if continued for another year will form a ten years' collection since 1929. The Research Assistant has, therefore, commenced a detailed analysis and the preparation of a report on the collection stored at the Krusadai Biological station.

* Vide note by Professor Tattersall at page 482 of "Nature", Vol. No. 142, dated 10th September 1938.

57. (iii) VIZAGAPATAM LABORATORY.—The Laboratory attendant was in charge of the museum and stores. He assisted the Inspector in the statistical work and in the collection and sampling of specimens. Commercial fishery products such as chank bangles, etc., were added to the exhibits of the museum.

58. (iv) MARINE AQUARIUM LABORATORY.—Twenty samples of sea water collected at the Pulicat Oyster Farm were titrated at the Marine Aquarium Laboratory for the estimation of their chlorine contents.

Mr. Job of the Zoological Research Laboratory, Madras University, continued his study on food habits of fishes in the Aquarium Laboratory.

Sri Chidambaram (Acting Inspector of Fisheries—Inland) recently recruited by the Madras Public Service Commission worked at this laboratory on oyster culture from May to July 1938.

Specimens of aquarium and larvicidal fishes were supplied to the following :—

Sri C. Soorya Rao of Adyar.
Mr. H. E. Edwards of the Madras Club.
Mr. Polkinghorn, Chief Officer, S.S. "Ethiopia."
Messrs. General Electric Company (India), Madras.

(b) Technological Research.

59. (i) FISHING METHODS—*Deep sea fishing experiments.*—Enquiries are being made for chartering a suitable deep sea fishing power boat and qualified expert fisherman for continuing the experiments commenced by "Lady Goschen." Offers have been received from the Indian Trawling Company, Bengal, Madras Fisheries Company, Mount Road, Madras, and Messrs. H. Ohmiya & Co., of Japan and are under consideration and correspondence with the respective firms.

60. The Coble in the meantime has been transferred to the Mettur Dam for patrol duty pending the construction of a motor boat sanctioned for the lake.

61. (ii) TANUR EXPERIMENTAL STATION—*Advanced Research on fish manure, etc.*—The Imperial Council of Agricultural Research have not allotted funds so far for the scheme already approved and sanctioned by them, though they promised to consider the availability of funds early this year. The Madras Government's contribution to the station was therefore resumed provisionally (vide G.O. R. No. 678, Finance, dated 27th October 1937).

Part of the equipment for the chemical laboratory as well as reference books ordered have been received. The old school shed at the station is being repaired and altered to house the chemical laboratory.

62. *Experiments with sodium hypo-chlorite.*—The working instructions for the electrolyser purchased last year from Messrs. Mathers and Platt, Limited, Bombay, were received last May. Sodium hypochlorite with two per cent available chlorine will be manufactured at the Aquarium for experiments with this chemical in preserving fish to be conducted at Tanur.

63. *Experiments with carbon dioxide.*—The plant for filling tins with carbon dioxide continued to give service. Prawns are now stored only in an atmosphere of carbon dioxide. The cured fish stored in carbon dioxide in the experiments mentioned in paragraph 82 of the last year's report did not appear to benefit by the treatment, as there was rusting in evidence when the tins were opened and contents examined on 27th June, 23rd October 1937 and 3rd May 1938.

64. The experiment was primarily intended to test whether storage of cured fat fish in an inert atmosphere would arrest the rusting noticed under usual conditions of storage brought about by the oxidation of fat. Since the ' podimeen ' was almost devoid of any fat, the experiment was repeated with mature oil-sardine. On 15th September 1937, two kerosine tins were packed with cured oil-sardine while one was filled with carbon dioxide, the other was kept as control. On 29th November 1937, when the tins were opened and the contents examined, it was found that the fish in both the tins were completely covered with a brownish film of oxidised oil; and the tins contained small quantities of a deep red and rancid oil. The samples of oil from the two tins were separately collected and the acid values determined. They showed an extraordinary high percentage of free fatty acids in the tin treated with CO_2 as follows :—

Sardine in carbon dioxide	45·08 mgs. of K.O.H. per gm.	
Control	25·4	do.

Free oxygen is not always necessary to bring about oxidation of easily oxidisable substances. In the presence of moisture and some labile organic peroxides anerobic oxidation can take place, the peroxide acting like a catalyst.

65. *Experiments with prawn pickling.*—The pH of the pickle found in European samples has never been found to be more acidic than 6·8. Even a very weak trace (0·001N) of acetic acid in 4·5 per cent sodium chloride solution would have a pH value of about 3·9. Since the acid value of the pickle (brine and vinegar) used in the experiment so far was found unduly high compared with the pickle in European samples which never exceeds 6·8 it was suspected that there cannot be any vinegar in the medium used in pickling prawns.

A further analysis of the pickle at the Guindy Institute showed the total absence of vinegar. Experiments have, therefore, been restarted with pure brine.

66. *Experiments in pilchardizing fish for long storage.*—Continuing the experiments mentioned in paragraph 85 of last year's report, three more fish of economic importance were treated during the year.

(1) 572 lb. of mature oil-sardine, which gave 448 lb. of gutted and cleaned sardine was pilachardized on 12th December 1937 in a wooden cask and was replenished with saturated brine on 23rd December 1937, 16th January, 3rd February and 28th April 1938. On the last-mentioned date dark red oil was noticed to float on the top. As the oil is likely to turn rancid and spoil the fish, it was removed and cleaned with saturated brine. The fish was found to be excellently preserved, very firm and white in colour, but the oil was found to have imparted a bad smell to the fish. The experiment is continuing.

(2) 80 lb. of ' adavu ' (*Lactarius lactarius*), which when cleaned and gutted weighed 72 lb. nett, was pilchardized with 1 : 3 salt in a small cask on 18th October 1937 and was found in an excellent state of preservation when examined on 27th November 1937, and re-examined on 2nd May 1938. The fish are still continuing in good condition of preservation.

(3) One hundred large cat fish were purchased and pilchardized on 18th May 1938 following a Canadian method recently described * and are under observation.

67. *Experiments with cemented vats and glazed pots.*—The 16-gallon jar supplied by the Standard Tile and Clay Works, Alwaye, in January 1936—vide paragraph 87 of last year's report—was subjected to further severe tests during the year, and has successfully withstood all of them, as no appreciable deterioration has been noticed. The introduction of this improved hygienic curing receptacle in the east coast fish-curing yards with or without the imposition of a cess is receiving the attention of the department.

68. *Fumigation with carbon bisulphide.*—To eliminate all possible objection to the use of this agent which has proved invaluable for storing salted and sundried fish, the fish treated for a full year with a sample of its control was sent to the Guindy Institute for sulphur test. The analysis showed a sulphur content of only 0·06 per cent which works out to about 0·27 gm. per pound of fish. The dose of sulphur permissible under the British Pharmacopœia is 1·2 to 4 gms.

* Bull. No. 19-II of the Biological Board of Canada.

The test at Guindy therefore has proved that the process is absolutely inocuous. In the experiment intensive treatment was resorted to. While for grains and cereals 1 oz. of the chemical is prescribed for every 15 cubic feet of space or one pound of the chemical for every ton of cereals, half an ounce has been used for one pound of dried fish every month from 25th November 1936 to 21st December 1937, i.e., nearly 280 times the required minimum quantity and yet the percentage of sulphur found is only 0·27 gm. per pound against the permissible limit of 1·2 to 4 gms. This shows that the process can be adopted for storing cured fish without any hesitation.

69. The complete success of this reagent for long storage of salted and sundried fish having thus been established, the next step was to ascertain the minimum quantity of chemicals required per unit quantity of cured fish and the number of times the fish should be fumigated for proper storage. With this end in view six experiments in kilner jars were started. Fish cured on the same date were placed in seven kilner jars, one pound in each jar. Three of these are being fumigated with half an ounce of carbon bisulphide at regular intervals of two, three and four months. Another three such jars are being fumigated every month with one-fourth, one-eighth and one-sixteenth of an ounce respectively of carbon bisulphide. The seventh jar is being kept as control.

70. As glass jars or other air-tight containers may be too expensive for fish-curers the suitability of mud pots which are the cheapest receptacles on the market has to be tested. A large mud pot was purchased for conducting the experiments. Fifteen pounds of cat fish cured on 23rd May 1938 were used for this experiment and fumigation with 0·5 ounce of carbon bisulphide per pound is being done every month.

71. *Vitamin survey of fish oils.*—The vitamin survey of South Indian fish oils was continued with the help of the Nutritional Research Laboratory at Coonoor, pending receipt of necessary apparatus ordered for Tanur.

The oils tested during the year and the results were :—

Name of fish.	Scientific name.	Results.
1 Saw fish ('Vela') (liver).	*Pristis cuspidatus* ..	More than an average Sample of cod liver oil.
2 Ray fish oil (Manal Thirukkai).	....	Only traces.
3	*L. revulatus*	Small quantities—poor when compared to cod liver oil.
4 Sardine (Mathi) ..	*Sardinella longiceps* ..	1/10th to 1/20th of the content of the ordinary medicinal cod liver oil.
5 'Palameen'	*Scomberoides moadetta*, c.v.).	Nil or trace.

Name of fish.	Scientific name.	
6 'Neimeen'	*Scomberomorus commersonius.*	Nil or trace.
7 Shark (liver)	*Carcharinus laticaudus* ..	Roughly 3 to 4 times richer than ordinary med. cod liver oil.
8 Indian Eagle Ray (liver)	*Aetobatis guttata* (Shaw) ..	437·5 y. per gramme.
9 'Kanan kalaru' ..	*Arius thalassinus* ..	250·0 ,,
10 Hammer headed shark (liver).	*Zygæna blochii*	7,615·4 ,,
11 'Pothi kelaru' ..	*Arius jello*	Trace.
12 Saw fish (Ilippa meen).	*Pristis perrotteti*	1,125·0 y. per gramme.
13 Gunna Sorrah ((liver).	....	2,200 ,,
14 'Kuppili' sorrah (liver).	*Carcharinus melanpterus.*	Only a trace.

Oils from Nos. (7), (10), (12) and (13) have therefore proved of great commercial importance as their vitamin potency was far higher than that of ordinary medicinal cod liver oil.

72. An important matter that was settled during the year was the undoubted presence of vitamin A in appreciable proportions in the Malabar sardine oil (a body oil). The test in 1933 was the only evidence of the presence of vitamin A in this oil till now—vide paragraph 79 of administration report for 1935–36. This was confirmed during the year, vide item (4) above.

73. It has by no means been established that the vitamin value so far ascertained for the liver oil of some sharks is the maximum that can be expected. When the method of extraction is improved on up-to-date lines, and precautions to avoid oxidation during boiling and storage are adopted, the oil will probably be found to be far richer in vitamin A. As the manufacture of fish oil on a commercial scale in all fishing villages of the Presidency is contemplated, apparatus for the colourimetric determination of vitamin A potency was supplied to the Tanur station in order that the station might carry on tests independently of the Coonoor Nutrition Research Laboratory. The method consists of the measurement of the intensity of the blue colour developed by a known weight of oil with Carr-price Re-agent (antimony trichloride in anhydrous chloroform). The standard of comparison is the colour produced in the same re-agent by standard chrystalline carotene (the precursor of vitamin A) dissolved in purified coconut oil. The report of the Medical Research Council on the "standardization and estimation of vitamin A" maintains that hydroquinone of a 0·01 per cent concentration is able to keep 0·0033 per cent solution of carotene in coconut oil without impairing the vitamin A potency for 185 to 398 days at 37° C. A solution of carotene in coconut oil stablized with 0·01 per cent hydroquinone would therefore provide a ready standard for all the experiments. A good colourimeter of the "Dubsoc" type which can be used for both micro and macro tests has been supplied to the station this year. The method, however, cannot claim the accuracy

of the spectrophotometric method generally employed by leading research institutions. Yet comparison with a good standard of known and constant vitamin A value is all that can be employed cheaply and quickly in a quasi-industrial station like Tanur. Further owing to the lack of electric equipment and the heavy cost of a spectrophotometer this more precise method cannot be adopted at present at Tanur.

74. With the discovery that shark liver oil possess an extraordinary high vitamin potency, and in view of the public demand for a cheap substitute for imported cod liver oil, for therapeutic use, the department, at the instance of Government, is considering the question of organizing and developing the manufacture of shark liver oil as a cottage industry in the Presidency. The shark oil now produced on the coast is crude and unpalatable and does not possess its full vitamin potency through ignorant and improper handling. Further the quantity produced is negligible. There are several kinds of sharks in Madras waters and the oil extracted from all of them has to be tested before the shark with the highest vitamin value and one which is available in sufficient abundance can be selected. With this in view a comprehensive scheme has been drawn up and submitted to Government for their sanction, whereby the officers in charge of fish-curing yards will manufacture the oil in the initial stage by way of demonstration and have samples of such oil tested for its vitamin A value at the Tanur station which has now been equipped with the necessary apparatus. They are also required to do propaganda so that the fishermen themselves might be induced to take to the industry, the department undertaking to test the oil for a small fee and find a sale for the oil. In order that the improved Tanur method of manufacture might be studied by the other officers of the department, who are expected to supervise and guide the manufacture in the yards and in the villages, a demonstration of the process has been arranged for at Ponnani, a heavy shark-fishing centre. The itinerant officers are to carry a portable set of vessels for oil extraction while on tour and demonstrate by actual extraction the process in all yards and schools, when they visit them during their inspection tours.

75. *Storage of fish oils.*—Owing to scarcity of oil-sardine during the last few years, the experiment in the storage of oil could not be conducted. For the present it is decided to use coloured glass bottles and glass carboys for storing medicinal fish oils till a more suitable non-metallic container is found.

76. *Anti-oxident (maleic acid).*—An experiment to prevent loss of vitamin A in storage of oil by adding maleic acid as recommended by the Biological Board of Canada, started on 9th May 1937 with the sardine oil available in stock did not yield satisfactory results.

The oil being old was evidently devoid of any vitamin A. Much difficulty was experienced in titrating the free fatty acids in an alcoholic solution with phenol-phthalein as indicator. Alkali Blue 6 B, an indicator specially recommended for alcoholic titration of coloured solutions has been supplied to the station. A new experiment will be tried with shark liver oil high in vitamin value.

77. *Research on sea-weed manure.*—Arrangements are being made to remanure the two coconut trees in the station compound under experiment and four other trees in the same plot when the rains cease.

78. The tests with different containers to determine the best receptacle to keep the manure for long storage made at the Marine Aquarium proved the absolute superiority of glass containers; tin affects the colour of the manure after two or three years, and gunnies are not suitable for long storage, as the manure in this container loses its properties and absorbs moisture hastening deterioration.

79. Manure prepared with fresh proportions of sea-weed (one part), fish (one and a half parts) and matti shells (two parts) on 10th and 11th January 1938, is under observation. When examined on 10th August 1938, it was found in good condition.

80. *Research to lengthen the life of fishing craft and tackle.*—The Ascu treated logs in a catamaran at Rayapuram (vide paragraph 99 of last year's report) are still in good serviceable condition. These logs, treated in 1933, have now outlived their second set of companion logs (vide paragraph 66 of administration report for 1935–36). The treated logs are free of borers even after five years.

81. The fence erected with the Ascu treated fencing materials in the Tanur North fish-curing yard continues to be in good condition though three years old.

82. *Treatment of nets.*—Since the closure of the Fisheries Training Institute, Calicut, the several kinds of fishing nets belonging to the institute have been transferred to Tanur, and the nets proposed for experiments were not bought. One K. P. Balan, ticket holder No. 10 of the Tanur North Yard, has undertaken to try the treated nets in return for a share of the catches.

83. *Ascu plant.*—The lid of the Ascu cylinder was repaired and provided with a hinge by St. Vincent's Industrials, Ltd., Calicut, but the compressor needed overhauling. This has also been done. The plant, however, is not yet in working order and the Industrial Engineer has been requested to set the apparatus in working order.

84. *Purchase and manufacture.*—The fishing season at Tanur was very poor. A total of 12,903 lb. of fish costing Rs. 330–6–6 was purchased and cured during the year as against 12,806 lb.

of fish for Rs. 480–12–6 in the previous year. Nine thousand eight hundred and twenty-six pounds of fish at a cost of Rs. 174–8–6 as against 35,876 lb. of fish for Rs. 381–8–8 last year, were purchased for fish meal operations.

85. The total output for the year was 2,060 lb. of cured fish, 2,045 lb. fish meal, 430 lb. pink meal, 7 lb. fish guano, 351 lb. fish bones and 14 gallons 1 bottle fish oil at a cost of Rs. 743–15–2 as against 2,636 lb. of cured fish, 8,306 lb. fish meal, 151 lb. pink meal and 62 gallons fish oil at a cost of Rs. 1,386–10–5 in the previous year. The reduction in the amount of fish meal manufactured was due to scarcity of sardine and other cheap shoaling fish.

86. *Sales.*—Two thousand and six pounds of cured fish, 2,218 lb. fish meal, 3,941 lb. fish bones, 3,447 lb. fish guano, 489 gallons 2 bottles of fish oil and miscellaneous articles costing Rs. 2,575–10–0 were sold during the year as against 2,459 lb. cured fish, 9,901½ lb. fish meal, 4,730 lb. guano, 321 gallons fish oil and miscellaneous articles valued Rs. 4,423–12–7 sold last year.

87. *Stock.*—The year closed with a stock of 128 lb. small prawns, 100 lb. cat fish, 7 lb. fish meal second class, 351 lb. fish bones and 145 gallons 4 bottles fish oil as against 130 lb. of small prawns, 96 lb. fish meal, 3,941 lb. fish bones, 3,040 lb. fish guano, and 626 gallons 3 bottles fish oil in the previous year.

88. *Receipts and expenditure.*—The receipts for the year amounted to Rs. 2,709–12–0 as against Rs. 4,839–3–4 in the previous year. The expenditure excluding the establishment charges of Rs. 2,804–12–0 amounted to Rs. 4,736–9–7 against Rs. 4,521–6–1 last year.

89. *Enquiries.*—(1) Mr. S. R. Kaka, a merchant from Colaba (Bombay), wanted to know the types of nets used in fishing at Tanur, and some other details, and a brief description with cost of the process of smoking fish, and he was supplied with full information.

(2) The Deputy Director of Agriculture, Western Circle, Amroati, was furnished with addresses of firms in the Presidency who deal in fish guano and manure.

(3) Sri S. A. Subramania Mudaliyar, landlord and merchant, Pondicherry, was supplied with information regarding the trade in shark fins such as places where available, current prices and the names and addresses of merchants dealing in the commodity.

(4) The Secretary, All-India Village Industries Association, Wardha, Central Province, asked for chemical and biological values of South Indian fish oils when compared with foreign products in quality and prices, and he was furnished with full information

available and the stage reached in fish oil investigations in this department.

(5) Mr. M. B. Majumdhar of Calcutta enquired whether there are any firms in South India who would help him to dispose of his collections of prawn dust. The name of a firm in Ceylon which deals with continental firms was supplied to him.

(6) Sri N. K. Srinivas, fishery technologist of Nagercoil (Travancore), was supplied with information regarding the preparation of fish oils.

(7) Mr. M. L. Mitter of Calcutta applied for a sole agency in India for fish oils rich in vitamin content, and asked for samples for independent test at the Government test house, Alipore (Calcutta). He was informed that his request will receive attention as soon as samples of oil are prepared.

(8) The Technical Adviser, Bhuj, Kutch State, enquired what prospects are available on the West Coast for establishing a factory for quick freezing of perishable foodstuff especially fish. Necessary information was furnished to him.

(9) Mr. G. Azrilenko, of Quick Freezing Food Refrigeration Company of Bombay, was supplied with statistics of fish landed on the West Coast for purposes of considering the question of establishing a factory on the West Coast for the quick freezing of fish.

90. *Training of apprentices.*—Sri P. A. Unni of Nayarampalam, Narakkal (Cochin State), worked as an apprentice at the Tanur station and attended operations at the Tanur North fish-curing yard from 29th September to 15th December 1937.

91. *Advertisement.*—In the course of an interpellation in the Legislative Assembly regarding fish manure, one honourable Member suggested that general propaganda may be carried out in the villages for the use of fish manure. Government wanted information as to what has been done so far and what further action can be taken to extend the use of manure. They were informed that the market for the grade of manure produced is limited and the prices offered by villagers is also too low, as compared with those obtained in Ceylon, and from planters in India and in foreign markets. However, the manure is advertized through the medium of the Agricultural Calendar, and exhibited in the various villages and rural exhibitions where the use and value of fish manure is explained to the ryots. The Agricultural Department has also done sufficient propaganda to popularize the use of fish manure, and all possible help and advice is being given both by this department and by the Agricultural Department to the manufacturers of guano and to ryots in the disposal and use of fish manure.

92. The products of the Tanur station were advertized as usual in the Villager's Calendar, by the travelling motor vans of the Agricultural Department and at the various exhibitions held throughout the Presidency during the year.

93. *Further retention of the station.*—Government have sanctioned the continuance of the station for a further period not exceeding one year from 1st April 1938 pending orders on the future of the station (G.O. No. 814, Development, dated 28th March 1938).

B. ADMINISTRATION.

(a) Public fish-curing yards.

94. There were 100 fish-curing yards at the beginning of the year, including the private yards at Malpe and Padu-Thonse, and the same number continued throughout the year. Of these, 12 are in charge of sub-inspectors, 87 in charge of petty yard officers and one is in charge of a peon.

95. (i) EAST COAST (NORTHERN SECTION).—The number of yards in this section remained 26 as last year, of which the yards at Pukkilipeta and Mulapeta continued to be temporary ones. All the yards are in charge of petty yard officers.

96. The question of shifting the Calingapatam yard to Bunderpeta is still under correspondence. The proposals for opening new yards at Kottapalam and Nizampatam have not yet materialized as the fishermen are finding it difficult to accept the condition imposed by Government, namely, depositing a security against loss in working the yard. Since the close of the year, the Nizampatam fishermen have agreed to make a deposit.

97. *Review of the chief coastal fisheries.*—Judging from the catches, the six most important fish economically of the Northern Circars during the year were Sardine, Ribbon fish, Jew fish, White bait, Silver-bellies, and Pomfret in the order of their importance by weight and value, except Pomfret which is the fifth in value. Sardine, Ribbon fish and Jew fish occurred all the year round, Sardine abounding in the months January to March, and Ribbon fish in July, August and June. White bait and Silver-bellies were absent in July.

98. *Transactions.*—The weight of fresh fish brought to the yards was 120,356 maunds 11 seers, the quantity of salt issued during the year was 15,100 maunds 10 seers and the quantity of cured fish removed was 68,542 maunds 32 seers, against 95,253 maunds 15 seers of fresh fish, 12,937 maunds 13 seers of salt, and 55,373 maunds 33 seers of cured fish last year. The fishing season which was unfavourable in 1936–37 was normal during the year. As the total

landings of fish in the area served by the yards is estimated at 331,073 maunds, about thirty-six per cent is brought to the yards for curing, the balance being either sold fresh or privately cured with bazaar salt or even without salt as in the case of white bait.

99. *Supply of salt.*—The total quantity of salt supplied to the yards was 15,254 maunds as against 12,454 maunds in the previous year. Of this 1,902 maunds was monopoly salt and 13,352 maunds excise salt. The rate paid per maund of monopoly salt was Re. 0–6–6 and of excise salt from Re. 0–4–0 to Rs. 1–4–0. The rates paid during the previous year were Re. 0–5–6 to Re. 0–6–6 per maund of monopoly salt and Re. 0–3–0 to Rs. 1–6–6 per maund of excise salt.

100. *Wastage of salt.*—There was a wastage of 29 maunds 17 seers of salt during the year at the Mulapeta fish-curing yard, as the store-shed, etc., caught fire on 31st August 1937.

101. *Balance stock of salt.*—The balance stock of salt in all the yards on 30th June 1938 was 1,412 maunds 19 seers against 1,288 maunds 6 seers last year.

102. *Transport of salt.*—The salt supplied to the Pudimadaka yard was found to cost 8 annas, the price paid to the manufacturer, and Re. 0–4–6 for transport to the yard, whereas the salt supplied from Tuticorin to the northernmost yard in the South Kanara district was only 10 annas per maund including transport. Further local salt has a high admixture of clay. Whether salt could be supplied from Tuticorin to Northern Circars yards is therefore under consideration.

103. *Reforms in yards.*—Continuing the experiment with white salt, the yard officer, Baruva, cured 25 seers of fish at a total cost of Rs. 2–4–6, but as the fish sold only for Rs. 2–0–0, there was a loss of Re. 0–4–6. In a subsequent experiment with 1 maund 10 seers of fish, the expenses amounted to Rs. 2–11–6, but the sale realized Rs. 2–15–6; there was thus a gain of Re. 0–4–0. These trial cures show that the allegation of the curers that fish cured with white salt is not salable is not quite correct.

104. *Fence.*—The experiment in growing a live fence in fish-curing yards of screw pine, aloes, and cathedral cactus in place of prickly-pear destroyed by cochineal was continued. A live fence has been successfully grown in some of the yards.

105. *Damage to yards.*—On account of a fire that broke out in the village on the night of the 31st August 1937, the Mulapeta yard buildings were destroyed. There was however no damage to the records which were promptly removed by the petty yard officer, but the salt bags were burnt and there was a wastage of 29 maunds and 17 seers of salt which was written off the accounts. A temporary roofing for the peon's room was promptly put up for storing

the salt and the damaged buildings were subsequently reconstructed at a cost of Rs. 174.

106. (ii) EAST COAST (CENTRAL SECTION).—The number of yards was 9 as last year. All the yards were under petty yard officers of whom six were newly recruited secondary school-leaving certificate holders. The question of shifting the Irrukam yard to a site near Monakuppam village to which the fishermen of Irrukam have migrated is under consideration.

107. *Review of chief coastal fisheries.*—The season was not altogether favourable and was distinctly poorer than last year. The chief shoaling fishes that appeared during the year were Pomfret, Ribbon fish, Mackerel, Sardine Mullet and Prawns. Pomfret appeared in large numbers in July at Kadapakkam, Pulianjerikuppam and Nelathurpalayam and from December to April at Kondurpalayam. Ribbon fish shoaled off Sathankuppam, and Kondurpalayam between July and February and Mackerel during August off Kadapakkam and Nelathurpalayam. Sardine occurred in July off Kadapakkam, in August off Pulianjerikuppam and from January to March off Sathankuppam. Mullet were caught off Mangodu, Medicalkuppam, Irrakam, Kondurpalayam and Nelathurpalayam from October to June. Prawns appeared in January and February off Mangodu, Irakkam and Pulianjerikuppam.

108. *Transactions.*—The total quantity of fresh fish brought to the yards was 78,876 maunds 8 seers, salt issued was 11,976 maunds 17 seers and the quantity of cured fish removed from the yards was 45,524 maunds 5 seers against 90,261 maunds 1 seer, 13,494 maunds 24 seers and 50,820 maunds 24 seers respectively last year. The fall in the transactions was due to failure of the fishing season in the Krishnapatam and Sunnambukolam Circles, and the floods in the Pulicat lake in November 1937, which affected the operations in the Irrukam fish-curing yard considerably. The ' Kuppam ' near this yard suffered also from malaria in a very virulent form unknown in recent years. Consequently the fishermen migrated to the adjoining village and the operations in the yard had to be suspended for about six weeks. There were poorer transactions in the Kondurpalayam and Nelathurpalayam yards owing to private curing with swamp salt. Kadapakkam and Kothapatnam yards however have had improved transactions.

109. *Supply of salt.*—The total quantity of salt supplied to the yards was 11,980 maunds as against 13,230 maunds last year. As no monopoly salt was available on account of the closure of the Madras salt depot, excise salt was purchased from Chunnampet, Voyalur, Tada and Krishnampatam factories. The rate paid per maund of salt ranged from Re. 0–2–1 to Re. 0–4–8 and the transport charges from Re. 0–1–7 to Re. 0–4–0 per maund.

110. *Wastage of salt.*—There was a wastage of 24 maunds 35 seers of salt on 24th December 1937 due to an accident to the boat which conveyed salt to Mangodu fish-curing yard. The cost, however, was recovered from the transport contractor who was found to be responsible for the accident.

111. *Balance stock of salt.*—The stock of salt at the beginning of the year was 613 maunds 2 seers, and at the close of the year 591 maunds 30 seers.

112. *Transport of salt.*—As the transport boat at Krishnampatam was unserviceable, transport of salt to the three neighbouring yards was done departmentally till November, and later by a contractor at cheaper rates. The question of replacing the boat is under consideration. Transport of salt to the other yards is also done by contractors.

113. *Yard fence.*—All attempts to grow a live fence around the fish-curing yards by planting Korukapuli and aloes have failed. The question of providing wire net fencing for the yards is under consideration.

114. (iii) EAST COAST (SOUTHERN SECTION).—The number of yards in this section continued to be 14. All the yards were in charge of petty yard officers.

115. The villagers of Killai approached the Hon'ble Minister for Agriculture and Rural Development for a fish-curing yard, but they were unable to deposit the necessary security against loss. The question of removing the Point Calimere yard further inland to safeguard it from sea erosion was deferred, as the transactions in the yard are decreasing year by year.

116. *Review of chief coastal fisheries.*—On the whole the fishing season was normal; while some fisheries were poorer, others were better than last year.

117. In the Tinnevelly district 'Savalai' (*Trichiurus*) and 'Tiruvenganai' (*Pellona*) fisheries continued to be good, while the 'Tondon' (*Dussumieria*), 'Cat fish' (*Arius*) and Sardine fisheries were poor. The 'Savalai' fishery which was poor in recent years revived during the season at Idintakarai. It, however, continued to be poor at Ovari due to unfavourable weather conditions.

118. In the Ramnad district the absence of shoals of 'Thiruvenganai' (*Pellona*) at Mukkur, 'Kalar' (*Anodontostoma*), 'Nethili' (*Stolephorus*) and 'Sudai' (*Sardinella finbriata*) at Attankarai, 'Chepilli' (*Lutjanus*) and 'Parai' (*Caranx*) at Nambuthalai account for a poor fishing season. At Mukkur, the 'Tondan' fishery was fair.

119. In the Tanjore district Seer, Horse mackerel, and Pomfret were very abundant at Vanagiri, *Lactarius* at Tranquebar, Cat fish and Mullet at Muthupet and Shark, Skate and Rays at Adirampatnam and Sethubavachatram, while at Arcotthurai, the important Hilsa, Pomfret and Jew fish fisheries were very poor and at Point Calimere Thread-fin, Cock up and Jew fish fisheries were a failure.

120. Following the recent years of heavy rainfall the rotation in the fisheries of Palk Bay reported in paragraph 206 of my administration report for the year 1931–32 has commenced. With the destruction of the weeds in the banks, the perennial 'Senkanni' (*Psammoparca*) fishery had terminated and the catches of cat fish, skate and rays had taken its place.

121. *Transactions.*—The quantity of fresh fish brought to the yards was 60,590 maunds 3 seers, salt issued to curers was 13,031 maunds 29 seers, and weight of dry fish removed from the yards was 42,907 maunds 14 seers against 58,228 maunds 24 seers of fresh fish, 12,208 maunds of salt, and 40,732 maunds 5 seers of dry fish in the previous year. Except at Idintakarai and Ovari in the Tinnevelly district, Vanagiri, Tranquebar and Muthupet in the Tanjore district transactions in the rest of the yards were poorer than last year.

122. *Supply of salt.*—The total quantity of salt purchased during the year was 16,000 maunds from Tuticorin, Kulasekharapatnam, Keeranur, Morekolam, Vattanam, Adirampatnam, Vedaranyam, Tranquebar and Neidavasal factories against 12,522 maunds last year. The price of salt per maund varied from Re. 0–1–6 to Re. 0–5–0 against Re. 0–1–5 to Re. 0–5–0 per maund last year.

123. *Transport of salt.*—As the transport of salt by boat from Tuticorin to Idintakarai and Ovari yards during the season when heavy catches are made is sometimes difficult owing to unfavourable weather, road transport at heavy cost has to be resorted to. To overcome this difficulty, it is proposed to construct additional store sheds in these yards. The transport charges to these yards during the year worked out to Re. 0–5–9 per maund. Transport of salt from Tuticorin by boat to other neighbouring yards worked out to an average of Re. 0–3–5 per maund, while that to Arcot Thurai by boat to Re. 0–0–6 per maund, and to other yards by bullock carts from Re. 0–0–11 to Re. 0–5–6 per maund.

124. *Wastage of salt.*—There was no wastage of salt during the year.

125. *Balance stock of salt.*—The stock of salt in the yards on 30th June 1938 was 6,167 maunds 38 seers against 3,199 maunds 27 seers last year.

126. *Reforms in yards.*—A model shed was constructed at Attankarai yard at a cost of Rs. 630–13–0.

127. *Yard fence.*—Vigorous efforts were made this year to plant hedges of aloes, screw pine, etc., in all the yards except Pinnacayal and Sippikulam, where live fence has not proved a success.

128. *Pit manure.*—A sum of Rs. 12–12–0 was realized by sale of manure at the Sippikulam yard against Rs. 14–8–0 last year.

129. *Miscellaneous.*—The usufructs of palmyra and coconut trees in the fish-curing yard were leased out as usual resulting in a revenue of Rs. 22–4–0 against Rs. 20–15–0 last year.

130. (iv) WEST COAST.—There were 51 yards at the beginning of the year, including the private yards at Malpe and Padu Thonse. The same number continued throughout the year. Of these 12 were in charge of sub-inspectors, while the rest were in charge of petty yard officers, except a private yard in charge of a peon.

131. *Yards closed or newly opened.*—The two private yards proposed to be opened at Kidiyur and Malpe (vide paragraph 141 of the last year's report) have not yet been opened. Sri Annayya, who wanted a private yard at Malpe has fallen ill. Sri Sesha Marakala who wanted a yard at Kidiyur has agreed to pay Rs. 250 per acre as site value for the land to be assigned to him by the Revenue Department, and he is arranging to open the yard in October 1938. The opening of the Hejmadi fish-curing yard was delayed on account of the difficulty of getting possession of the site selected. The reopening of the Kizhur yard, which was closed in 1930 on account of poor transactions, is under consideration as the fishermen who are handicapped for want of the yard, have made a request through their Co-operative Society for the reopening of the yard. Proposals for opening two new yards at Edakazhiyur (between Puthenkadapuram and Mannalamkunnu) and at British Cochin are under investigation. Government have sanctioned the reopening of the closed yards at Meladi, Elathur, Beypore North and Kaipamangalam.

132. *Review of chief coastal fisheries.*—In the South Kanara district oil-sardine appeared in fairly large quantities in September but disappeared by the end of November. Small quantities were, however, caught in December in Adakathbail, Bockapatnam, Kumbla and Thannirbhavi. The catches of mackerel were poorer than last year though it appeared in August and continued till March. Cat fish were caught in large quantities in the neighbourhood of Hungercutta, Hosabettu, Baikampadi, Thannirbhavi and the six yards south of Mangalore. Prawns appeared from August to October, and in January, March and June, though the catches were poor. 'Sole fish' (*Cynoglossus*) were caught from August

to October. 'Mullan' appeared in small quantities in August to October and in June. 'Thalayan' (*Trichurus*) was caught from August to October and in February and March, but the catches were poor. 'Nethal' (white bait) did not appear at all, while 'Tholiyan Mathi' (*Sardinella fimbriata*) appeared in Malpe I in August and April and Kirimanjeshwar yard in October and January respectively.

In the Malabar district all the varieties of shoaling fishes except 'Tholiyan Mathi' appeared during the year. Cat fish and prawns shoaled throughout the year. Oil-sardine appeared from July to December and in January. Mackerel were scarce except at Kirimanjeshwar yard throughout the year, only very small quantities were caught except in July and February in which months they were absent. 'White bait' were caught from July to October and in June, and 'Chambaṇ' (*Selar crumenophthalmus*) from August to October. Silver bellies appeared from July to November and in March, May and June, while 'Ribbon fish' shoaled from July to November and from February to June. 'Chalamathi' (*Sardinella*) appeared throughout the year, while 'Sole fish' (*Cynogeossus*) were caught from August to November and in January, February and May.

133. *Transactions.*—The total quantity of fresh fish brought to the yards was 951,084 maunds 25 seers, salt consumed was 159,676 maunds 20 seers, and dry fish removed from the yards was 608,696 maunds 23 seers against 1,124,674 maunds 29 seers of fresh fish, 181,773 maunds 16 seers of salt, and 690,602 maunds 13 seers of dry fish in the previous year. The Kirimanjeshwar yard showed very heavy operations, the consumption of salt being two and a half times that of the previous year due to heavy catches of mackerel. Six yards in South Kanara south of Mangalore showed a consumption of more than double the quantity of salt consumed last year due to heavy catches of cat fish. Madai, Mattol, Madakara and Madapalli and Badagara yards also had heavy operations on account of heavy catches of Mullan, Chamban, Menthal, Oil-sardine, Chalamathi, Cat fish and Miscellaneous fish. Malpe, Azhicode, Tellicherry, Thalayi, Beypore South and Parapangandi yards showed a fall in operations due to scarcity of Mackerel. The fall in Quilandy was marked due also to absence of Mackerel. The fall in operations at Karimpuram, Puduponnani, Veliangodu, Palapatti and Mannalamkunnu yards was comparatively heavy, while in other yards there was no appreciable difference in the extent of operations.

134. *Systems of curing.*—The Colombo and Ratnagiri methods of curing were in vogue in Kirimanjeshwar, Gangoli, Hungercutta, Padu-Thonse, Malpe and Udayavar. The Colombo system was also

followed in Ullal. Owing to the scarcity of mackerel and miscellaneous fish, operations under these systems of curing were much lower than in the previous year.

135. *Demonstration curing sheds.*—In the demonstration shed at Malpe 12,000 mackerel of medium size were purchased on 7th February and cured at a total cost of Rs. 96. The cured fish was sold for Rs. 103–8–0 resulting in a profit of Rs. 7–8–0.

136. *Standard curing sheds.*—There were 599 curing sheds built according to type design at the beginning of the year (315 in South Kanara and 284 in Malabar). Twenty-seven (10 in South Kanara and 17 in Malabar) new sheds were constructed during the year, and the tickets of 17 curers who owned model sheds in South Kanara district were cancelled. There was thus a net increase of 10 type-design sheds raising the total at the end of the year to 609 (308 in South Kanara and 301 in Malabar). In the Hungercutta yard, 9 type-design sheds were washed away by sea erosion, two of which were reconstructed by the ticket-holders, while there is no room for the other sheds to be constructed. A new site is proposed to be acquired for the yard. The ticket-holders are generally alive to the advantages of having type-design sheds, but want of funds stands in their way. The total number of temporary sheds still existing is 102 in South Kanara and 480 in the Malabar district.

137. *Damage to yards.*—More than half the site of the Hungercutta yard has been washed away by sea erosion and the question of acquiring an adjacent site for the use of the yard is under consideration of Government. Two temporary sheds to store salt have been constructed in the adjacent site pending its acquisition. There was no erosion by sea in the Vadanapalli yard this year. A portion of the fence in the Tellicherry yard was damaged by fire on the night of the 29th December 1937 when a fire broke out in the adjacent village, Chalil, and the damage was repaired at a cost of Rs. 20.

138. *Supply of salt.*—The total quantity of salt supplied from Tuticorin was 156,400 maunds against 188,007 maunds 30 seers last year. There was no depletion of salt in any of the yards during the year except in Kootayi, where on 30th September 1937, the stock went down to 6 maunds and about 50 maunds of bazaar salt had to be purchased by the curers to treat that day's heavy catches. The yard was however immediately replenished with stock from Ponnani.

139. *Supply of salt to other departments.*—Twenty-four maunds of salt to the Sub-Jail, Mangalore, from the Mangalore yard, 240 maunds from the Cannanore yard to the Cannanore sub-jail, and

146 maunds from the Calicut yard to the local sub-jail and the Mental hospital were supplied during the year. Twenty maunds of salt were also supplied to the Tanur fisheries station, from the Tanur yard.

140. *Wastage of salt.*—There was only a wastage of 67 maunds 35 seers during the year against a wastage of 651 maunds 29 seers last year. Of this quantity 14 maunds were lost in the sea at Bekal. Issue price and duty have been recovered from the contractor on a wastage of 7 maunds 29 seers, and a wastage of 4 maunds 10 seers remains to be written off. The rest of the wastage resulting from causes beyond the control of the transport contractor was written off the accounts.

141. *Balance stock of salt.*—The balance stock of salt remaining in the yards at the beginning of the year was 155,158 maunds 5 seers and at the end of the year 151,390 maunds 11 seers.

142. *Pit manure.*—The brine manure collected in the Malpe I yard was sold for Rs. 53 against Rs. 75 last year.

143. *Private curing.*—Only at Badagara and Cannanore yards was private curing resorted to by the curers with bazaar salt. About 250 bags of salt at Badagara and 10 bags at Cannanore are reported to have been used for the purpose.

144. *Miscellaneous.*—The experiments in growing a live fence with korukapulli at the Manjeswar, Quilandy and Tanur North yards are fairly satisfactory. Experiments tried in the other yards to grow korukapulli have not been successful partly due to want of care on the part of the yard staff and partly due to poor soil. The absence of proper watering arrangements in the early stages also accounts for the drying up of the young plants.

145. *Visits.*—The Hon'ble Sri M. C. Raja, the interim Minister, visited the Tanur yard on 1st July 1937. The Hon'ble Sri V. V. Giri, Minister for Labour and Industries, visited the Calicut North yard on 10th October 1937 and the Hon'ble Sri V. I. Muniswami Pillai, visited the Calicut North yard and the Tanur North yard on 27th November 1937.

146. *Establishment of a salt factory on the West Coast.*—The Collector of Salt Revenue has been addressed for permission to conduct the experiments in salt manufacture at the proposed site, on certain conditions mutually agreed to, viz. :—

(1) The department shall maintain a correct account for the salt manufactured and the salt shall be kept in safe custody.

(2) A sample of salt manufactured shall be sent to the Collector of Salt Revenue for analysis.

(3) Any officer of the Salt Department who may be authorized by the Assistant Commissioner, Central Division, will be given every facility whenever he visits the experimental station to watch operations and check stock.

(4) A detailed report on the results of the experiments with the total quantity manufactured during the season shall be sent to the Collector of Salt Revenue. If the experiment is to be continued beyond April 1939 fresh instructions from the Salt Department will be necessary.

(b) Private Oil and Guano Factories.

147. Eighty-seven factories in South Kanara and 58 factories in Malabar worked during the year against 43 and 60 in the previous year. The oil produced was 211 and 206 tons, guano 798 and 767 tons, and fish manure 538 and 85 tons in South Kanara and Malabar districts, respectively. The price of oil ranged from Rs. 80 to Rs. 280 per ton, in South Kanara district, and from Rs. 100 to Rs. 250 in the Malabar district. The price of guano was from Rs. 30 to Rs. 80 per ton in the South Kanara district, and Rs. 25 to Rs. 85, in Malabar. Fish manure was sold for Rs. 28 to Rs. 60 in South Kanara and from Rs. 20 to Rs. 45 in Malabar.

II. MINOR MARINE AND ESTUARINE FISHERIES.

A. Prawns.

148. Further research on prawns in the Collair lake was not possible during the year owing to the deputation of the permanent Inspector of Fisheries as Director of Fisheries, Baroda State, and the appointment of a non-scientific Inspector, and the failure of the fishery this season.

149. The installation of a drier on the Tanur model at Kottada for curing prawns in inclement weather is pending the selection of a suitable site.

B. Edible Oysters.

150. (i) Oyster Research.—The Pulicat lake received full supply of water this year during the November rains, the two bars opened during the third week of November and a regular communication with the sea and tidal ebb and flow has been established, factors so essential for the maintenance of oyster beds. Spat fall was unusually abundant. Edamani oyster park which was practically depleted during the last three years of water scarcity in the lake, has been again cultched. All the beds, 'Chinnaparaval', 'Light house' and 'Pulicat' beds are well stocked with spat and these are expected to attain a marketable size next season.

151. The bar is working also at Ennore and is expected to continue open for a considerable time. The favourable conditions have resulted in the early maturity and fattening of oysters at Ennore. The difference in the condition of the oysters of Gokulapalli and Ennore became so marked that the supply to the public had to be made from Ennore since the close of the year. The factors responsible for the difference are under investigation.

152. The spreading of oysters on mats has succeeded at Pulicat and a further area of mud flats was similarly treated.

153. Research on the early development and life history of the edible oyster (*Ostrea arakanensis*) was revived in the Aquarium laboratory from April 1938, when Sri K. Chidambaram, a first-class B.Sc. (Hons.) candidate was recruited as Inspector of Fisheries (Inland). Oysters from Gokulapalli were first examined but since they did not contain ripe gonads, Ennore oysters which showed more rapid development and contained ripe gonads were used. The media used had a salinity of 18 %. The early stages of development were noted. About 20 minutes after fertilization, the ova showed signs of segmentation, which continued for about three hours till the ova became blastulæ. After five hours, these blastulæ that were at the bottom began to swim by means of cilia and came to the surface. About 16 hours after fertilization they became active and transformed completely into gestulæ. Soon after their movements became slow, and the larvæ died. They survived only up to 24 hours after fertilization. More experiments were conducted with the same result. As it was not possible to rear the larvæ for more than 24 hours, efforts to continue the investigation will be made this year.

154. (ii) OYSTER SUPPLY.—The 1937 season was closed on 30th November 1937 and the 1938 season commenced on 12th March 1938. Sixty-three thousand eight hundred oysters, all from Gokulapalli beds, were sold to the public during the year against 70,996 oysters in the previous year. The sale-proceeds amounted to Rs. 1,151–13–0 against Rs. 1,450–7–0 last year, and the expenditure was Rs. 1,579–6–0 against Rs. 1,541–5–10 in the previous year.

155. (iii) SHELL LEASES.—The right to collect dead mattee shells for lime burning in the Ennore oyster beds was leased out for one year from 1st July 1938 for Rs. 500, and those of the Pulicat oyster farm for Rs. 415.

III. INLAND FISHERIES.

156. The prospects of inland fisheries this year were altogether brighter than last year. Most of the tanks and rivers received a sufficient supply of water on account of good rains and there was an

all-round increase in fish rentals. The Cauvery rentals, however, are still low but this is due to the formation of the Mettur reservoir which deprives the river below of heavy floods. The valuable Hilsa fisheries, for instance, have suffered heavily and there is not much hope of retrieving that fishery. The steady decline in rentals noticed since the formation of the dam has, however, been arrested and this year there has been an increase of Rs. 3,671 over last year. The only hope of recouping part of the loss in the Cauvery lies in developing the fishery of the Mettur reservoir and exploiting it to its maximum capacity. Steps towards this end were taken during the year and are expected to result in appreciable revenue.

A. Research.

157. (i) RESEARCH ON RURAL PISCICULTURE.—Research on Inland Pisciculture is generally highly technical and on account of the peculiar South Indian conditions of rainfall, agriculture and system of irrigation, kinds and habits of local fish require long and patient research and continued observation and study for the solution of their problems. For a comprehensive and intensive research on the various problems relating to the occurrence, life history, breeding seasons, suitability for stocking waters, their food, conditions of growth, and the physical and chemical characters of the water suited for each, their enemies and diseases, etc., a scheme for a fresh water biological station was drawn up and sanctioned by the Imperial Council of Agricultural Research, and is still awaiting allotment of funds. Meantime the post of the Assistant Director (Inland) which fell vacant has been filled by the appointment of Dr. D. D. Dasen, M.A., PH.D.

158. (ii) DEEP-WATER TANK FISHING EXPERIMENTS.—The water-level in the Mopad reservoir was high throughout the year on account of heavy rains, and the high winds made fishing difficult. Nevertheless fishing with the methods devised for deep-water was persisted in throughout the year and resulted in nearly half the catches made last year in low water. With the usual methods, the reservoir would have been unfishable. The catches during the year were as follows as compared with those of the previous year :—

Year.	1937–38.	1936–37.
Total number of fish caught ..	3,145	8,940
Weight in pounds	6,018	11,298¾
Sale proceeds of fish	Rs. 444–4–4	Rs.832–9–8
Total number of Catla caught ..	406	1,845
Weight in pounds	1,387¾	4,371

159. One more method in deep water fishing still remains to be tried at Mopad. The net has been ordered and experiments will commence in the ensuing year.

160. Sufficient experiments in deep water fishing have been done for us to advise private lessees to conduct perennial fishing in the Mopad reservoir. In the drive for economy in expenditure attempts were made to lease out the reservoir, but no contractor was bold enough to take the lease, owing to difficulties of transport to distant markets, and want of sufficient facilities for merchants to come and live in Mopad during the term of the lease. Since the close of the year, however, one Md. Ksim Sahib of Duvvur has been persuaded to take the lease for Rs. 785 and fish the lake with the advice and help of the department. The conditions of the lease will be (1) that the reservoir should be fished continually as hitherto, (2) the contractor should use the different methods that have been evolved, and any new methods that the department wishes to try, and (3) that he should defray all expenses connected with the fishing and take in return the sale-proceeds. He should render an account of the sizes and kinds of fish caught daily to the Assistant Inspector. This will enable the department to dispense with the staff of fishermen and watchers which is the main item of expenditure at Mopad. The continuance of the Assistant Inspector with a fisherman, however, will be necessary to assist him in maintaining statistics of catches, records of scientific observations and in advising and helping the contractor to conduct fishing continuously on approved methods.

161. (iii) Fish Breeding—*Avalanche hatchery for trout.*—The Avalanche hatchery was operated as usual by the Nilgiri Game Association and 52,000 trout fry were liberated.

162. Mr. Clementson of the Mavankalla estate, Nilgiris, complained to Government, in his letter dated 30th June 1938, that heavy poaching occurs in the Moyar. The fall in Cauvery rentals dates back from the time the Moyar was handed over to the Forest department and is presumably due at least partly to poaching. The Hon'ble Minister for Agriculture and Rural Development accompanied by the Secretary to Government, Development Department, inspected the Moyar at Guruvey-kavunda-hundi for devising better methods of patrolling the river by the appointment of fish watchers.

163. *Hilsa hatchery.*—The Hilsa hatchery experiments were attempted at Boberlanka on the Godavari anicut from 14th October to 9th November 1937. Ripe eggs were available, but live fish with oozing eggs were obtained only on one day.

164. As the well in the Hatchery was not found sufficiently deep arrangements were made to deepen it. Since the coolie charges for pumping water from the well to the overhead tank of the hatchery were found to be heavy, Government were addressed for a power pumping set at a cost not exceeding Rs. 550. Government have

sanctioned the purchase since the close of the year (G.O. No. 2025, Development, dated 18th August 1938).

165. *Other Hilsa investigations.*—The investigations relating to the rate of growth and life history were continued in the Cauvery and the results have further corroborated the conclusions reached in Godavari (paragraph 157 of the Administration Report for the year 1935–36). Dr. Hora, who recently collected young Hilsa in the Calcutta Corporation water tanks at Pulta found that my conclusions hold good for that river also.* A Bulletin on the Hilsa is under preparation.

166. *Gourami.*—The causes for the failure of this fish to breed in Ippur and Mopad fish farms and for their successful breeding in a local pond in Mopad selected by me twice in 1937 are being closely studied. The fish is continuing to breed satisfactorily in Sunkesula and Præma fish farms.

167. *Catla.*—The most important event of the year is the proof obtained of the breeding of Catla at the Hoginakal Falls in the Cauvery river. Since 1922 the Cauvery river has been stocked with Catla from the Godavari. The evidence of Catla breeding below the dam has been accumulating since 1933. This year during an inspection of the Hoginakal Falls at the upper end of the Mettur lake evidence of Catla breeding at the very falls was obtained by the capture of a mature female, measuring 32¾ inches and weighing 28 lb. with loose ripe eggs on 18th July 1938. The fish was netted at the foot of the largest of the falls called ' Peria vani ' where even a motor boat was unable to approach on account of the rapid current. Thus the breeding of Catla in large rivers and its capacity to swim against rapid currents in rocky gorges has been established. The Catla in the lake are found to congregate close to the falls at all times of the year and the fish watcher asserts that he has come upon large shoals of young Catla consisting of thousands of fish in the upper reach below the lake. This will be investigated during the year. The fish is now well known at Hoginakal as ' Thoppa ' fish.

168. For intensive experiment in breeding Catla and Labeo, so far not artificially bred in any fish farm, a pond was chosen at Sathiavedu, near Madras. The pond was taken over on 2nd July 1938. Experiments will commence after remodelling the pond.

169. *Etroplus.*—This fish, though slow in growth, continues to breed wherever it has been introduced. The breeding of Etroplus for stocking the Nellore district tanks inadvertently stopped four years ago by the late Assistant Director of Fisheries was restored this year.

* Records of Indian Museum, Vol. XL, Part II, pages 147–158.

170. *Mullets.*—Ever since the discovery of large mullet in fresh water irrigation tanks along the Nellore coast in 1917, the department has been stocking the provincialized tanks with mullet fry from backwaters in the Nellore district. The operation is empirical and needs the collection and identification of species of fresh water mullet that grow to a marketable size and the study of the characters of the fry which will enable their selection for stocking purposes. With the appointment of a scientific officer as Assistant Director (Inland) this long delayed and much needed work has been started.

171. *Estimation of productivity of ponds and tanks.*—Nearly every enquiry received from tank and pond owners relates to the amount of fish that they can grow in their ponds. Quantitative experiments for estimating total productivity in ponds was not done in any of the farms due to the absence of a qualified Assistant Director for the Inland section. Sunkesula fish farm with its admirably controlled fish ponds is eminently fitted for this economically important experiment. To begin with Gourami and Catla have been selected for experiment.

172. The second set of experiments is to ascertain the effect of different kinds of pond weeds on water and fish culture, and three of the nursery ponds in the Sunkesula farm are set apart for the same.

B. Administration.

173. (i) FISH FARMS—*Sunkesula.*—The farm's primary aim was the stocking of permanent tanks and the Kurnool-Cuddapah canal with food fish. A museum of named collections of food fishes and a herbarium are being maintained.

174. This fish farm contains 14 fish ponds in which Gourami and Etroplus are being reared. During the year the fish ponds were emptied, silt cleared and fish distributed according to sizes into different fish ponds. One hundred and twenty fairly big Gourami were selected for sale, out of which 114 were sold to the public for Rs. 45–10–0. In addition to Gourami and Etroplus, carp fingerlings netted during the first floods of the Tungabhadra river are stored in the farm for stocking the Kurnool-Cuddapah canal and the outlying tanks in the Kurnool, Bellary and Anantapur districts. So far Catla was not introduced into any of the ponds in the Ceded districts due to excessive cost of bringing them from the Godavari river. As Catla are available in Edurur swamp and are said to occur in the Tungabhadra river, it has been arranged to stock the irrigation tanks with Catla this year.

175. *Præma-fish-farm.*—The extension of the farm is proceeding. Two ponds have been dug in the swamp and hold water. Full instructions as to the depth to which ponds have to be excavated, the sloping of the beds to correspond with water-bearing strata and the lining of the bunds with impervious clay have been given to the staff. At the request of the Conservator of Forests, Bellary, Gambusia culture for the anti-malarial stocking of the Nallamalais waters was commenced during the year.

176. The farm staff has been suffering from attacks of malaria. As a preventive measure their quarters have been provided with mosquito proof wire-net windows and doors.

177. *Ippur fish farm.*—The working of the farm requires a complete overhaul to bring it to maximum efficiency. The transfer of responsible officers in charge of the farm for supervision of fish-curing yards and the reduction of the staff to a couple of ignorant workmen, who are not even fishermen, have reduced all chances of useful work at the farm. The fieldman now posted in charge of the farm is a move in the right direction.

178. That the Ippur fish farm is unsuitable for Catla has been demonstrated beyond doubt by experiments since 1924. On no occasion was the mortality normal nor growth satisfactory. In 1931 the late Assistant Director noted this fact. However, stocking the ponds with Catla was persisted in for unintelligible reasons till 1937, even abandoning Etroplus breeding which had given extraordinary results.

179. The last stocking was with 400 Catla in the Etroplus pond in 1935 and another 450 in 1937. Only 73 Catla survived which were sold for Rs. 27–3–0.

180. No more experiment with Catla is warranted. It is definitely proved that, like Gourami, Catla is extremely sensitive to even traces of brackishness. The sub-soil water at Ippur is highly saline—vide analysis at page 35 of the Administration Report for 1932–33. The difference between canal water and the sub-soil water in dissolved salt was 7·1 : 122·3. In spite of free supply of fresh water from the Pennar, the ponds become brackish with dissolved chlorides in summer when the supply ceases. Food fish tolerant to brackish water should, therefore, be experimented with in future, such as *Labeo fimbriata*, *Mullets*, *Chanos*, etc. The probationary Assistant Director has been given full instructions in the matter.

181. Predacious murrel have gained access to the protected pond. I notice from the inspection remarks of the farm that one was seen by the Assistant Director on 23rd November 1935, but as the pond was not cleared of the pest their number has increased. Nevertheless, the safeguards provided have improved the condition of the pond sufficiently to induce Gourami to build several nests and make

an attempt to breed, but no young Gourami was available in the pond. The water which is more or less fresh, turns, however, slightly brackish in late summer, and this apparently is the adverse factor even more than the presence of murrel which has been preventing Gourami from breeding successfully at the Ippur farm. The weeds in the pond are *Chara*, a distinctly brackish water-weed. The typical fresh-water weeds such as *Hydrilla* are absent, in spite of efforts to grow them. The last doubt that remains to be cleared is whether the failure of the fish to breed is due to brackishness or to the existence of murrel which destroy the young fry. This problem will be conclusively solved in the coming year, as the pond has been cleared of predacious fish.

182. *Mopad fish farm.*—Though young Catla in various stages of growth have been figuring in daily catches and amount to nearly 50 per cent of the total weight of the annual catch, conclusive evidence of Catla breeding in the reservoir still remains to be obtained. The last stocking with Catla fingerlings was on 6th October 1935 when 1,155 fingerlings measuring from 1 inch to 1½ inches were liberated in the lake. On 24th January 1938 four young Catla measuring 4 to 5 inches were noticed. These could not be the fry stocked in 1935 as the growth of Catla at Mopad is rapid and the fry of 1935 should have reached a considerable size by January 1938. In order to obtain further proof, Catla stocking will be stopped for a number of years and statistics will be collected from catches of the number and size of young fish. If young fish continue to figure in the catches, there can be no doubt that Catla has established itself in the reservoir.

183. The second important piscicultural problem solved is the complete eradication of murrel. As there is no great change in the chemical composition of the reservoir-water and the river-water above and below the reservoir, the disappearance of murrel is attributable only to the great changes that have occurred in the biological conditions of the lake. The great depth, the wind-swept surface, the absence of weeds in shallow margins appear to be the factors that have led to the extermination of murrel (*Opheocephalus striatus*). Unlike *O. marulius O. striatus* lives in weedy shallows in stagnant water. Whether the formation of the Mettur reservoir will also lead to the eradication of the allied species of murrel (*O. marulius*) is being watched.

184. The third problem that has to be solved at Mopad is the successful breeding of Gourami. A beginning has already been made in the stocking of the lake with Etroplus and this fish is now occasionally caught in the lake. This is the first record of the recapture of Etroplus in the reservoir. Gourami will also be stocked in the reservoir with a view to establish this valuable food fish at Mopad.

185. The Hon'ble Ministers for Rural Development and Local Administration visited the Mopad fish farm on 8th and 9th February 1938.

186. *Vellore fort moat fish farm.*—Stocking the various sections of the moat with anti-malarial and valuable food fishes was continued. Gourami continues to thrive and breed satisfactorily at the farm.

187. At the instance of the Vellore Municipal Council, the Collector of North Arcot proposed that the Vellore fort moat may be permanently filled with water, and enquired whether this can be done without detriment to Government interests and to improve the appearance of the moat and to prevent the mosquito nuisance in the fort area. The Collector was informed that the moat is not responsible for any mosquito nuisance as suspected, and that on account of the presence of larvicides, the lotus grown in the Gourami pond will not shelter mosquitoes. The only portion where mosquito is apt to breed is in the pools in the silted-up portion in the south of the moat. The best way to deal with this section for preventing mosquito breeding will be to excavate it to a proper depth to hold water. Since this will be very expensive, the alternate course is to level and slope the portion to have an even and straight water margin when the water dries up in the hot weather, to prevent chances of stagnation of water which is apt to shelter the mosquito larvæ out of reach of larvicides. If the moat is to contain water at all, the only remedy against mosquito breeding is to maintain an adequate stock of larvicidal fish, as other anti-malarial treatments such as periodical oiling, etc., are not suitable for such a large sheet of water. It was on account of this, Government decided that the Fisheries department should carry on this work, though the maintenance of the moat even now rests with the Public Works Department. In the circumstances, there was no need to fill the moat completely with water or to suspend the culture of food fish at the expense of revenue to Government.

188. The Hon'ble Minister for Rural Development and the Hon'ble Minister for Public Health visited the Vellore fort moat farm in December and November 1937 respectively. His Excellency the Governor of Madras visited Vellore in October 1937.

189. *Chingleput fort moat fish farm.*—The moat was stocked with 2,200 Etroplus fingerlings. The portion of the moat that was drying was leased out for Rs. 25 in July 1937. Government ordered as a measure of economy that the post of Assistant Inspector of Fisheries here may be kept in abeyance, and the fish farm at Chingleput be placed in additional charge of the Assistaant Inspector of Fisheries,

Vellore. Accordingly the farm was placed under the Assistant Inspector, Vellore, from 3rd August 1937.

190. *Chetput brickfields fish farm.*—The two ponds already constructed have not been handed over to the department, as the ponds became inundated with water and one of the ponds sustained damage during the heavy rains last November. The question of raising their bunds to prevent inundation during heavy rains is under the consideration of the Public Works Department. Catla that was stocked in one of the ponds before the rains, escaped when the bunds breached. Pending the grant from the Imperial Council of Agricultural Research for the establishment of a central fish farm, Government have entrusted the Public Works Department with the maintenance of the brickfields in a sanitary condition.

191. (ii) METTUR PROJECT FISH FARM.—The construction of six fish ponds sanctioned in G.O. Ms. No. 1629, Development, dated 21st September 1936, was completed, but since the ponds were found leaky, it was not possible to take charge of them. Government have sanctioned a further sum of Rs. 2,270 to remedy the defects by providing the ponds with a bed of clay in G.O. Ms. No. 1147, P.W., dated 8th June 1938. Funds, however, have not yet been allotted. Shade and fruit-trees have been planted on the bunds and a barbed wire fence to exclude cattle is being erected.

192. *Patrolling the reservoir.*—Pending the purchase of the motor boat sanctioned for the reservoir, the Yorkshire Coble, which has been named ' Pinctada ' was transferred from West Hill to Mettur on 28th January 1938 for patrol work. The boat is not powerful enough for duty at Mettur as the currents are strong in the upper reaches of the lake.

193. *Prohibition of fishing at Mettur.*—Ever since the construction of the dam, heavy destruction of fish occurs immediately below the dam and the surplus weir at Mettur whenever the shutters are raised for letting out water. As is well known fish, particularly breeders, have a tendency to swim against current and assemble in dense shoals at the dam in their attempt to migrate upstream. This occurs about once a week and a large number of fish are caught within a few hours on each of these occasions. On nine occasions (from August 1937 to February 1938) when statistics were collected, the total number of fish caught amounted to 54,610, mostly large carp. Such ruthless destruction of fish which has continued since 1934 is suspected to be one of the primary causes for the steady fall of fishery rentals in the Cauvery. Complaints have been numerous from the lessees of the Tanjore and Trichinopoly districts that the fisheries of the river have seriously deteriorated. In the absence of

a special staff of watchers, the Public Works Department had to auction the right of fishing for Rs. 1,145 last year. Since the continuance of the lease and the destruction of the breeders will be disastrous to the future of the Cauvery fisheries, Government were moved for the discontinuance of the lease. The licensing of fishing in the reservoir was recommended instead. Government in G.O. Ms. No. 773, Development, dated 24th March 1938, accepted my recommendations, and called for draft rules to regulate fishing in the lake. Draft rules for licensing fishing in the reservoir have been submitted to Government since the close of the year.

194. Fourteen cases of poaching were detected and in twelve cases the poachers were successfully prosecuted. The culprits were fined up to Rs. 3 each by the Sub-Magistrates of Pennagaram and Omalur, hardly a deterrent punishment as a fraction of the catches is sufficient to pay the fine. Though reckless poaching has been effectively stopped, fish watchers have been assaulted, and many attempts have been made by interested villagers to stop them from discharging their duty. Such difficulties frequently occur in enforcing conservancy regulations, and the co-operation of other departments is essential in working the new rules.

195. *Buildings.*—The office and the quarters of the Assistant Inspector were shifted to the two buildings (Erectors' quarters) taken over from the Public Works Department in November 1937. The other two quarters were handed over to this department in January and April 1938 respectively to serve as store and hatchery. An overhead tank has been constructed by the Public Works Department for the hatchery buildings. A live fence has been grown round the buildings. The store, fittings and apparatus necessary for the farm are being ordered.

196. (iii) PERIYAR SCHEME.—In their Memorandum No. 350-I/38-1, dated 21st February 1938, Government did not consider it necessary to proceed with the scheme for the departmental exploitation of the fisheries of the Periyar lake at present, but ordered auctioning the right of fishing in the lake by the Public Works Department.

197. (iv) GANJAM TANK STOCKING SCHEME.—Of the taluks that comprised the old Ganjam district, only Chicacole and Ichapur are retained in this Presidency and are now included in the Vizagapatam district. A tank stocking scheme for these two taluks will be submitted to Government as a Part II Scheme for 1939–40. A statement of rentals derived from the tank fisheries of these two taluks for the five years ending 1937–38 has been framed and the average rental which has to be paid as compensation to the district board works out to Rs. 1,377–10–0.

198. (v) NILGIRI FISHERIES.—One case of illicit fishing with nets in the Ootacamund lake was detected on 19th January 1938 and the poachers were prosecuted before the Stationary Sub-Magistrate. The two accused in the case were fined each Rs. 10 or to undergo simple imprisonment for a week. A constable No. 214, who helped in capturing the culprits, was recommended for a reward of Rs. 10. The Ootacamund Municipality requested permission to ply boats in the lake, as they proposed to start a boat club to add to the amenities of the town and this was granted, and the Inspector was permitted by the municipality the use of their weed-removing-punt in the lake for official inspections.

199. The Director of Fisheries was elected an Honorary Member of the Nilgiri Game Association for 1937–38.

200. The Curator, Government Botanic Gardens, Ootacamund, wanted the lake and ponds in the Botanical Gardens to be stocked with suitable varieties of fish as suggested by the Hon'ble Minister for Agriculture and Rural Development. After an inspection, the ponds were stocked on 22nd June 1938 with 33 *Barilius gatensis* and 33 *Danio neilgerriensis*, which are ornamental larvicides. The most suitable variety of food fish for these ponds which is likely to grow to a marketable size and will be a demonstration in pisciculture to the public is the 'Mirror carp' (*Cyprinus carpio*). This European carp was introduced into the Nuwara Eliya lake in Ceylon and has given remarkably good results. The Secretary, Ceylon Fishing Club, Nanuoya, Ceylon, has been addressed for a supply of the fish. When received it is proposed to stock the Ootacamund lake also with this variety of quick growing carp as a preliminary to licensing fishing in the lake.

201. (vi) PISCICULTURAL SURVEY, TINNEVELLY DISTRICT.—At the instance of the President, "Buy Indian League", Tinnevelly, a survey of the perennial tanks of the district is under progress. If suitable waters are available, which are capable of improvement for augmenting the food fish supply of the district, a scheme will be submitted to Government for their provincialization.

202. (vii) GOVERNMENT HOUSE PONDS, GUINDY.—At the request of the Military Secretary to His Excellency the Governor of Madras the five tanks in the Guindy reserve and the ornamental tanks in the Government House Gardens, Guindy, were inspected by me on 22nd November 1937 with a view to suggest suitable fish and larvicides for stocking. A detailed report with suggestions was sent to the Military Secretary with the offer to stock the tanks, provided the rentals now credited to the Forest Department are credited to this department. The Military Secretary agreeing to the

proposal wanted the stocking with fish to be done early before the tank was auctioned for the year. The proposal was referred to the Chief Conservator of Forests, who has agreed to the proposal to stock the tanks pending a decision on the question of transfer of the ponds to this department, and the tanks were stocked with 200 Etroplus and 180 Catla fingerlings at a cost of Rs. 38–11–0, and 3,300 larvicidal fishes free of cost.

203. (viii) FISHING IN KODI TANK.—A petition was received from the fishermen of Coondapoor praying that the fishing rights in the Kodi tank might be sold by auction. The Tahsildar of Coondapoor was asked to auction the tank, but since it fetched only Rs. 4 it was not confirmed. A reauction will be tried.

C. Stocking Operations and Results.

204. (i) STOCKING OPERATIONS.—Stocking operations continued to be an important item of work of this section as usual. The following waters were stocked with Catla fingerlings at a cost of Rs. 1,205–1–6 :—

Cauvery above Mettur Dam	2,301
Vellore fort moat	1,739
Museum pond, Madras	1,139
Chetput fish farm	1,084
Veeranam tank	590
Confluence of the Bhavani and the Cauvery ..	560
Ippur fish farm	450
Madurantakam tank	400
Guindy park	180
Total ..	8,443

Two hundred Etroplus were also supplied to the Guindy park. One thousand larvicides were supplied to each of the municipalities of Conjeeveram and Chingleput for anti-malarial work.

205. (ii) SALE OF FISHERIES.—In G.O. No. 973, Development, dated 13th May 1937, Government passed orders on the Board's recommendations in the matter of disposal of tank and river fisheries for calendar and fasli years respectively to maintain uniformity in all the districts of the Presidency. This was given effect to during the year.

206. (iii) DISPOSAL OF FISHERIES BY PRIVATE TENDERS.—The fisheries of the following tanks fetched very low rentals in public

sale due to combination among the bidders and hence they were disposed of by accepting private tenders :—

Name of fisheries.	Name of lessee.	Amount of rental fetched by private tenders.	Amount offered in auction.	Period of lease.	Compensation.
		RS.	RS.		RS.
1. Muthialpad tank, Nellore district.	Shaik Abdul Sathoor Sahib, Duvvur.	525	210	Three years from 1st January 1938.	12½.
2. Alluru Pedda and Ravanna cheruvu, Bitramgunta cheruvu, Turimerla tank, Pedduputtedu tank, Kovur tank, Vidavalur tank, Mudivarti tank, Purini tank and Varini tank.	Kata nna Reddi and Sundaram Reddi.	2,800	1,980	One year from 1st January 1938.	2,007.

207. (iv) DISPOSAL OF FISHERIES BY CLOSED TENDERS.—The disposal of fisheries by calling for closed tenders in the Chingleput district produced better results than last year, while in the Nellore district there was no improvement.

208. (v) DISPOSAL OF FISHERIES TO CO-OPERATIVE SOCIETIES.—The following fisheries were leased to co-operative societies, during the year :—

		RS.	
1. New Coleroon ..	Vallampudugai Fisheries Co-operative Society.	1,500	One year from 1st July 1937.
2. Perar Fisheries, (Negapatam taluk).	Papakoil Fisheries Co-operative Society, Negapatam.	1,050	Do.
3. Veeranam tank (Valamadugu and Paraval items).	Lalpet and Udayargudi Fisheries Co-operative Society.	1,600	Do.
4. Sriperumbudur ..	Sriperumbudur Fisheries Co-operative Society.	100	One year from 1st January 1938.
5. Neemam tank ..	Poonamellee Fisheries Co-operative Society.	915	Do.
6. Mopad and Machavaram.	Kandukur Fisheries Co-operative Society.	750	Three years from 1st January 1938.
7. Markapur tank and Surplus channel.	Vemulukottah Fisheries Co-operative Society.	100	Three years from 1st April 1938.

209. (vi) Fishery Rentals.—There was some improvement in the rentals obtained this year. The total income during the year from inland fisheries was Rs. 82,782–15–5, against Rs. 69,738–1–4 last year.

IV. CROWN MONOPOLIES (PEARL AND CHANK FISHERIES).

A. Research.

210. (i) Pearl Oyster—*Spat falls outside the regular banks.*—The most important event of the year was the discovery of a spat fall in shallow water, $1\frac{3}{4}$ to $2\frac{1}{4}$ fathoms, 9 miles south of the Krusadai Pearl Farm for the first time in the history of Pearl Fisheries. The occurrence of a batch of oysters in shallow inshore water on a sandy bed off Vedalai was reported in March. The area covered by the oysters was roughly one-twelfth square mile and extended from a distance of two miles from the shore to three miles seawards towards Hare Island, one of the chain of islands skirting the coast. The oysters varied in size from 30 mm. to 105 mm. in length. They were found attached to weeds and Alcyonarians. Three hundred and two oysters were fished from 26th March to 6th April and were added to the Pearl Farm collection.

211. (ii) Chank-marking Experiments.—Three hundred and sixty-five chanks were marked and liberated during the year on the chank beds off Tuticorin in 8 to 11 fathoms against 375 last year :—

Name of beds.	Depth in fathoms.	Numbers marked on chanks liberated.	Total number liberated.
Vettiyakal Par ..	9	E. 316—E. 340 ..	25
Vadaolipathu ..	$9\frac{1}{2}$	E. 341—E. 368 ..	28
Podu Par	$9\frac{1}{2}$	E. 369—E. 410 ..	42
Kilavan Par ..	11	E. 411—E. 450 ..	40
Kathithirukkai Par ..	8	E. 451—E. 480 ..	30
Seltan Par	10	E. 481—E. 530 ..	50
Janathu Par ..	10	E. 531—E. 621 ..	91
Aluvai Par	9	E. 622—E. 680 ..	59
		Total ..	365

The total number of young chanks marked and liberated since the commencement of the experiment in 1931–32 is 2,829. Twenty-seven of these were recovered during the year bringing the total number so far recovered from the commencement of the experiment to 93. Of the marked chanks recovered during the year, flesh from

13 had been extracted inadvertently by divers in spite of warnings issued to them from time to time and hence they could not be returned to sea to further watch their growth and movements.

212. From the appended statement (Appendix II) giving the migration and rate of growth of the shells refished during the year, it will be seen that Chanks No. D. 857 and D. 858 showed the maximum rate of growth in length per month, viz., 1·02 mm. and chank No. D. 858 in diameter, viz., 0·66 mm. Three chanks Nos. D. 895, 899 and 920 have travelled the longest distance, i.e., 5 miles in 20 months and 11 days or about 14 yards a day and chank No. E. 67 travelled 3 miles in one year and eight days which is about the same rate.

213. (iii) DIVING EXPERIMENTS.—After adjustments, the new compressor, engine and the air bottles were given a trial on 4th and 5th July 1938 at the "Royal Bath," in the Madras People's Park by the Industrial Engineer and myself. The pump and the engine worked satisfactorily, and it was possible to raise the pressure in the bottles to 1,400 lb. per square inch in about 10 minutes. The diver was able to remain under water for about half an hour, though the adjustments of the pressure reducing valve were too complicated for the diver to manipulate, and much air was lost. The pressure reducing valve has to be simplified. It was also found that three air bottles were too heavy for the diver, and it is proposed to reduce the number to two bottles. The water circulation through the compressor still appeared defective, as free circulation of water was not obtained immediately the engine started. Steps are being taken to remedy these defects before conducting experiments in the sea.

B. Administration.

214. (i) INSPECTION OF PEARL BANKS.—The Rameswaram, Karangadu and Tondi banks having been inspected last year, the beds from Tuticorin to Cape Comorin were inspected during the year, in the order of rotation. No spat falls were found in any of the beds. A few stray oysters were found in the Kuthadier Thundu, Peria Malai Piditha Pars and in the southern section of the Tholayiram Par. They were however too few to be of value even as potential spat producers.

215. *Sand-wash.*—Some of the banks off Tiruchendur, viz., Nadu Malai and Peria Malai Piditha Pars were found to have suffered from sand accretion.

216. The inspection was conducted on board "Lady Nicholson" for 21 days from 16th March to 30th March 1938 and from 24th April to 29th April 1938.

217. (ii) TINNEVELLY CHANK FISHERY.—Three hundred and nine thousand two hundred and fifty-seven chanks, including 418 Idinthakarai chanks collected from fishing nets, were fished during the year against 398,782 chanks in the previous year.

218. *Recruitment of divers.*—Three dhonies were registered for the fishery from Kilakarai and Periapatnam during the year against six last year. In all 32 Kilakarai divers, 43 Periapatnam divers, 5 divers from the other parts of the Ramnad district, 4 Arabs, 1 Malayalee and 6 local Muhammadans, 5 Valayans, 9 Pallas and 32 Bharata divers of the Tinnevelly district enlisted as divers making a total of 137 against 203 last year. The number of boats that participated in the fishery during the year was 19 (16 canoes and 3 dhonies), against 22 canoes and 6 dhonies in the previous year.

219. *Advance to divers.*—An advance of Rs. 9 was outstanding with the divers at the beginning of the season. During the year, a sum of Rs. 200 was issued as advance and a sum of Rs. 121–11–0 recovered leaving the balance outstanding at the end of the year at Rs. 87–5–0.

220. *Boat loan to Sammatties.*—There was a balance of Rs. 151 due from Sammatties at the beginning of the year. Of this a sum of Rs. 19 was recovered during the year. The small recovery was due partly to poor fishing and partly to the fact that the divers could not be pressed for payment on account of their agitation for a higher rate of payment. A sum of Rs. 100 was issued as loan to Katchu Mohammad for purchase of a canoe during the year. Thus the total loan outstanding with Sammatties at the close of the year was Rs. 232.

221. *Quarters for divers.*—The foreign divers were accommodated in the old Police lines as usual.

222. *Rate per chank.*—The divers were paid at the rate of one anna per chank as before.

223. *Fishing operations.*—The fishery was commenced on 23rd November 1937 and closed on 27th May 1938. The number of days the boats went out to see for chank fishing was 135, against 145 last year. Unfavourable weather prevented fishing on 19 days and 31 days were Sundays or holidays. The fishery could not be commenced earlier on account of the agitation of the divers for increased rate per chank. The divers actually struck work from 6th to 8th January. The largest catch made by a single diver on any one day was 136 chanks valued at Rs. 8–8–0 against 314 chanks valued at Rs. 19–10–0 last year. The average earning per head per day for the actual number of working days and for the whole period of the fishery

was Rs. 1–11–0 and 14 annas against Rs. 1–15–9 and Re. 1-2-5 respectively last year.

224. *Inspection of chank beds.*—Twenty-five chank beds against 19 last year were inspected and buoyed during the year for fishing. Their names and the number of chanks fished from each are given below :—

Name of bed.	Number of chanks fished.	Name of bed.	Number of chanks fished.
Veerapandiyanpatnam karai bed ..	716	Janathu Par ..	20,469
Melaonpathu ..	13,492	Nilangalpathu ..	6,487
Eriettu ..	11,733	Kilavan Par ..	23,155
Kathithirukkai ..	6,591	Aluva Par ..	18,328
Saithonpathu ..	15,547	Kanava Par ..	1,182
Tholayiram ..	6,571	Saithprawl ..	12,707
Vadaonpathu ..	3,331	Vadaolipathu ..	5,361
Athonpathu ..	37,683	Pasi Par ..	1,150
Mela Kilathi ..	39.061	Seltan Par ..	6,180
Siluvai Par ..	23,973	Putharai Par ..	3,939
Vadaithundam ..	33,362	Saithkilathi ..	4,710
Kadayan Par ..	323	Total ..	308,839
Pulipoondu Par ..	9,620		
Pudu Par ..	3,168		

225. *A new chank bed.*—During the inspection of pearl banks a good chank ground was located in 6¾ to 8 fathoms off Ovari and Kooduthalai in the Tinnevelly district. The condition of this bank was identical with that of Rameswaram beds and the shells were of the same quality. A trial dive made by the inspection divers was very successful and about 200 chanks were fished by seven divers in 15 minutes.

226. *Immature shells.*—Out of 31,678 undersized shells brought ashore inadvertently by the divers, 18,422 were returned alive to the sea. The rest had their flesh removed by the divers and hence could not be returned to sea. The divers have again been warned not to extract the flesh from immature shells.

227. *Valampuri chanks.*—The Valampuri chank fished last year was sold for Rs. 500 to Rao Bahadur P. S. G. Rangaswami Nayudu of Peelamedu, Coimbatore district.

228. *Idintakarai chank.*—Four hundred and eighteen chanks were collected at Idintakarai from fishing nets against 394 last year.

229. *Catches.*—The following is the comparative statistics of catches for the three years ending 1937–38 :—

	1935–36.	1936–37.	1937–38.
Full sized	323,475	398,792	309,257
Undersized	20,781	6,454	13,256
Wormed	45,081	58,526	37,187

230. *Temperance.*—As usual tea, coffee and rice kanji were sold to divers within the chank godown premises to prevent them from going to toddy shops.

231. *Casualties.*—On 25th January 1938 one of the local Palla divers, Chelliah Kudumban by name, who went out for fishing chanks overstayed at the bottom of the sea. His co-divers who went with him in the same boat searched for him and brought him to the shore completely unconscious. Medical aid was given immediately. The diver expired, however, within a few minutes.

232. *Sale of chanks.*—Messrs. K. T. M. T. M. Abdul Kayoom Sahib Hussain Sahib, the purchasers of the 1935–36 season chanks, made complete payment for that season chanks and took delivery of them early this year. The same merchants purchased the 1936–37 chanks also for Rs. 212–8–0 per 1,000 and paid for them in full, and have taken delivery of 250,000 full-sized chanks and proportionate number of undersized and wormed chanks. They applied for extension of time up to 26th July 1938 for taking delivery of the rest and Government sanctioned the same in G.O. Ms. No. 1118, Development, dated 29th April 1938.

233. The catches of the 1937–38 season chanks are in stock and arrangements are being made for selling them.

234. (iii) OTHER CHANK FISHERIES.—Messrs. K. T. M. T. M. Abdul Kayoom Sahib Hussain Sahib, the lessees of the Tanjore, South Arcot, Chingleput and Nellore districts chank fisheries for three years from 1st July 1935, paid the rentals due for the year, viz., Rs. 750, Rs. 225 and Rs. 125 respectively. Tenders for the lease of these fisheries for a further period of three years were called for and the highest tenderer was Mr. M. K. Shumsudeen Maricar Sahib of Pondichery. The lease was therefore granted to him for an annual rental of Rs. 1,500 for Tanjore, Rs. 600 for South Arcot and Rs. 200 for Chingleput and Nellore district chank fisheries.

V. BIOLOGICAL SPECIMEN SUPPLY.

235. Six universities, 24 colleges and 8 other institutions all over India were supplied with biological specimens from Ennore. Of these, four colleges (three in the Bombay Presidency and one in the Punjab) were supplied with museum specimens for the study of animal life in secondary schools. The value of specimens supplied amounted to Rs. 2,925 against Rs. 2,364–10–0 last year.

236. No collection tour was undertaken by the Research Assistant during the year.

237. *Oyster shell-grit.*—More than 2 tons of grit for poultry was manufactured and sold during the year for Rs. 280 against

Rs. 218–14–0 last year. The demand for this commodity is increasing owing to the popularity it has received by advertisement and propaganda through the various agricultural and industrial exhibitions held in the Province year after year. Specimens of grit were exhibited in ten exhibitions held during the year. A new shell breaker and a hand-machine for manufacturing grit of various grades was supplied to the station.

VI. ANTI-MALARIAL WORK.

238. The stock of larvicides in the Chingleput fort moat was maintained at a cost of Rs. 18–2–3. Owing to a complaint from the Superintendent of the Police School, Vellore, that there is mosquito nuisance in the fort, steps were taken to clean the moat. At the request of the Military Secretary to His Excellency the Governor 3,300 larvicidal fish were supplied for stocking the Guindy Park ponds.

239. Anti-malarial stocking operations were conducted as usual on the Nallamalais and 96 permanent water holes were stocked with 49,500 larvicidal fish this year, at a cost of Rs. 174–5–6.

240. The larvicidal fish with which the mosquito breeding pond in Adderly Estate was stocked last year were found to breed and multiply vigorously keeping the pond clean of mosquitoes.

241. The Agent, Chittivalsa Jute Mills, was supplied this year also with 3,000 larvicides in October 1937 to stock a reservoir in the mill premises.

242. *Anti-malarial operations on the Kolli Hills, Salem district.*—Twenty *Barilius* and 25 *Danio malabaricus* were collected from the Bhavani river by the Inspector of Fisheries, Nilgiris and supplied to the District Forest Officer, Salem, in October 1938 for stocking the breeding pond constructed at the Kolli Hills by the Forest Department—vide paragraph 224 of report for 1934–35. The pond was stocked with these fish on 10th October 1935. The District Forest Officer, Salem, now reports that he visited the pond on 11th June 1938, and carefully examined it but no mosquito larvæ were found in the pond. He also found the fishes have multiplied as he was able to catch a pair easily to examine and see if they are the same species that were introduced from the Nilgiris. He made enquiries with the resident doctor in charge of the Mission dispensary and learnt that there is a marked reduction of malarial cases within the settlement during the last two years.

243. In his letter, dated 18th September 1937, the Conservator of Forests, Bellary Circle, enquired whether the forest subordinates can be trained in anti-malarial work, and asked for a list of springs, etc., that are stocked every year in Nallamalais and he was informed that the subordinates can be trained provided they are intelligent

and can distinguish larvicides from predacious and vegetarian fish and a list of waters usually stocked on the Nallamalais was furnished to him.

VII. SOCIO-ECONOMIC WORK.

A. Education.

244. (i) West Coast—(a) *Fisheries Training Institute, Calicut.*—The institute having been closed, vide paragraph 245 of the last year's report, the staff were discharged in the course of the year.

245. (b) *Village schools.*—There has been a rapid expansion of elementary education among fishermen, thanks to the liberal policy inaugurated by Government during the year. Not only did Government agree to extend to district board schools that cater for fishermen the scheme of special education planned by the department by taking over such schools but actually desired the department specially to investigate the need for new schools for the community —Government Memorandum No. 4256-I/37-1, dated 3rd January 1938. The number of schools at the beginning of the year was 37. Two new schools, viz., Bekal and Adakathbail, were taken over from the South Kanara District Board on 1st June 1938 (G.O. Ms. No. 893, Development, dated 2nd April 1938). Two new schools at Hejmadikodi and Kasarakodi were opened in the same district on 20th June 1938. In the Malabar district, a school for the Pudu Islam community was opened in the Puduponnani village on 1st June 1938. Thus at the end of the year there were 42 schools under the management of the Fisheries Department.

246. As a result of the investigation into the necessity for opening new schools along the coast made at the instance of Government, proposals for opening a school at Pudiangadi near West Hill, and another at Edakad and the taking over of an aided school in Muttam near Madai are under consideration. The proposal for opening two new schools at Vekkode and Pallipuram long objected to by the Education Department was sanctioned by Government after a joint inspection of the place by Fisheries and Educational officers, and the site for a shed for the Vekkode school is being acquired and an allotment of funds for the Pallipuram school is expected in the Budget for 1939–40. The proposal for opening a new school at Nambire Kadapuram (between Talikulam and Nattika) is under consideration.

247. *Strength.*—The number of pupils on the rolls increased from 4,541 to 5,162 during the year, the increase in the number of girls being from 1,578 to 1,840. The number of fisher children attending all the schools rose from 3,649 at the beginning of the year to 4,220 at the close of the year.

248. There has been a fall in attendance in Malpe and Kodi and in each of these schools one teacher's post has been abolished.

249. There is an increase in strength in all schools in the Malabar district except in Kavvayi, Madapalli and Naduvattam, the fall in Madapalli being appreciable. The decrease is reported to be due to the fact that out of 33 pupils who appeared for the elementary school-leaving certificate examination from this school, 32 came out successful this year, so that only one pupil came back to join the VIII standard. The fall was also due to the admission of some children into the neighbouring schools, about which a complaint has been received.

250. *Conductresses.*—The Government have sanctioned the employment of a conductress to each of the following schools:—Veliangode, Kaipamangalam, Naduvattam, Mannalamkunnu, Palapatti and Kannankadavu. The appointments wherever made have resulted in a steady and increased attendance.

251. (ii) EAST COAST—*Fisheries Technological Institute, Tuticorin.*—Since the closure of the Training Institute at Calicut, the question of opening a technological institute at Tuticorin on the East Coast (vide paragraph 228 of the Administration Report for 1932–33, and paragraph 246 of the Report for 1933–34) was revived. The proposed institute at Tuticorin while it will give a course in fisheries technics to trained teachers who are to be employed in fishermen schools is chiefly intended to function as a technological institute to train apprentices in all branches of the fishing industry including navigation. Fifteen scholarships tenable at the institute for fisher youths of the Parava community have been promised by leaders of that community. The abandoned harbour buildings on Hare Island with their extensive grounds and dockyard, with the open sea on one side and the Tuticorin bay on the other, provides an ideal site for a Fisheries Institute. A private gentleman of Tuticorin who has bought the buildings in auction has agreed to sell them to the department. A comprehensive scheme for the establishment of the institute has been drawn up and submitted to Government since the close of the year.

252. (iii) MARINE AQUARIUM.—The year under report was a record year for gate collections at the Marine Aquarium. The number of visitors increased from 114,474 last year to 126,730 this year; the only two other years when the attendance was greater than this, after the aquarium came under the charge of this department on 1st April 1919, were 1919–20 and 1920–21 when 163,517 and 161,699 persons visited the aquarium. The reason for the great influx of visitors during those years was the installation of electric lights in the tanks and the extension of the hours of opening. This shows that when the proposed new buildings come into existence with their many additional attractions and conveniences

there will be a decided increase in the number of visitors and consequently of revenue. The enhanced revenue will soon cover the initial investment on a new building.

253. The record attendance was as usual on 'Kannu pongal' day when 3,234 people visited the aquarium against 3,164 last year. There were only 896 visitors on the 'Vaikunta Ekadasi' day, during the year, against 2,241 in the previous year. This steady increase in the number of visitors to the aquarium since 1933-34 is an indication of the general economic recovery in the country, after the depression of 1932.

254. The daily average attendance was 347·25 against 311·75 last year. Sixty-three batches of school children visited the aquarium against 69 batches last year. Of the 63 batches 8 batches consisted of 357 children from Corporation and aided schools in the City, who were admitted free and 55 batches consisting of 2,581 children who were admitted at the usual concession rates. Thus the total number of school children that visited the aquarium was 2,938 against 3,417 last year.

255. The following were the distinguished visitors to the aquarium this year :—

Her Excellency the Marchioness of Linlithgow, the Vicereine and Mr. Mark Kerr.

Overseas delegates to the Science Congress Jubilee Session.

The Hon'ble Master Robert Erskine with Miss Turner.

The Archbishop of Madras.

The Hon'ble Minister for Agriculture and Rural Development.

Mrs. Butler (wife of Mr. Butler of the International Labour Office) with Mrs. Subbaroyan, Member of the Central Legislative Assembly and Mr. Martin.

Mr. A. H. Reginald Butler of the University of Manitoba, Canada.

Mr. Rashid Uddin Ashrof, K.B., O.B.E., Paisar of Bara Bunkee, United Provinces.

256. *Receipts*.—The gate collections amounted to Rs. 10,043–0–6 against Rs. 9,329–14–6 in the previous year and constitute a record. The sale of guide books, picture post cards and miscellaneous receipts amounted to Rs. 153–5–0 against Rs. 170–3–0 last year. A sum of Rs. 2,015 was received as rental for the lease of the restaurant. Thus the total receipts amounted to Rs. 12,211–5–6 against Rs. 11,513–1–6 in the previous year. The total expenditure amounted to Rs. 7,571–9–0 against Rs. 6,716–7–2 last year There has thus been an excess of receipts over expenditure of Rs. 4,639–12–3 against Rs. 4,798–10–4 last year.

257. *Improvements.*—A new cylindrical air tank for the hand pump was installed by the Public Works Department, and is working satisfactorily. The exit turn-style which was out of order was set right by the Public Works Department.

258. *Aquarium buildings.*—During the heavy November rains for about a week, the floor of the building was flooded with 3′ depth of water by percolation. The proposal for a new building is still under the consideration of Government.

259. *Additional and rare exhibits.*—Mr. M. Palkinghorn, the Chief Officer of s.s. " Ethiopia," is keenly interested in the aquarium and presented the following fishes :—

Betta splendens—' Siamese fighting fish.'
Brachydanio rerio—' Zebra fish '.
Xophophorous helleri—' Gold sword tail '.
Xophophorous brevis—' Silver sword tail '.
Rasbora heteromorpha—' Irridiscent fish '.
Lebistes reticulatus—' Guppy ' or ' Millions '.
Pterophyllum scalarae—' Angel fish ' :

The fishes have done well at the aquarium and three of them, *Xophophorous hilleri*, *Xophophorous brevis* and *Lebistes reticulatus*, have bred in the aquarium. Mr. H. C. Harley of Harrington Gardens, Madras, also presented to the aquarium a Siamese fighting fish. A small Hawk's bill turtle from Krusadai Island was added to the collections.

B. Co-operative Societies.

260. (i) WEST COAST.—The fisherfolk have now begun to realize the value of co-operative institutions. But the difficulty is that they are not generally regular and loyal in their dealings with the societies. Further many of them are heavily indebted to middlemen, " Mudalalies " who are fish merchants themselves. Hence they are not in a position to sell their catches to advantage. Even their own leaders exploit them. Co-operation therefore is a very important weapon in the uplift of the fisher class. The model by-laws framed for fishermen societies were recently remodelled to suit their present requirements and in accordance with the provisions contained in these by-laws, a scheme for improving the working of fishermen societies has been drafted at the request of the Registrar of Co-operative Societies. If that scheme is given effect to, the economic condition of the fisherfolk can be greatly improved.

261. (*a*) SOUTH KANARA.—The 15 societies that existed in this district at the beginning of the year continued to function till the end of the year.

262. *Members and paid-up share capital.*—In these 15 societies there were at the beginning of the year 705 members with a paid-up share capital of Rs. 13,062–2–0. During the year 47 members were admitted and a similar number were removed. Rupees 397–15–0 was collected towards share capital and Rs. 861–15–0 was paid off. Thus at the end of the year there were in the societies 705 members with a paid-up share capital of Rs. 12,598–2–0. The fall in the paid-up share capital was due to return of share capital of deceased members and of those who withdraw their membership. In this way Rs. 217 was paid off from the Kizhur Fishermen Co-operative Society, Rs. 424 from the Kasaragod Fishermen Co-operative Society and Rs. 78 from the Uchil Bovis Co-operative Society. Arrears under share capital in all the 15 societies amounted to Rs. 10,702–14–0. Attempts will be continued to reduce this amount during the current year.

263. *Deposits and borrowings.*—In the Uchil Bovis Co-operative Society fixed deposits amounting to Rs. 87–8–0 existed at the beginning of the year. Rupees 156–4–0 was received during the year and nothing was returned. A sum of Rs. 35 was also received during the year as monthly deposits and nothing was paid out. Anna fund deposits in the Coondapur Kharvis' Thrift and Loan Co-operative Society increased from Rs. 25–3–0 at the beginning to Rs. 101–4–0 at the end of the year, Rs. 81–7–0 having been received and Rs. 5–6–0 having been repaid during the year. Such deposits are encouraged both among members and non-members in all the societies.

264. Only two societies, viz., the Uchil Bovis Co-operative Society and the Iddya Mogers' Co-operative Society borrowed in all Rs. 1,525 during the year from the financing bank of the district. The former borrowed Rs. 1,045 and the latter Rs. 120. Thus seven out of 15 societies are now indebted to the Central Bank. From six of these societies Rs. 2,618 was paid back to the Central Bank towards principal during the year. The amount outstanding at the end of the year from all the seven societies was Rs. 6,175. Of this amount Rs. 5,164 was overdue from five societies of Mukkuva fisherfolk situated in Kasaragod taluk. Interest overdue at the beginning of the year was Rs. 253–7–0 and at the end of the year Rs. 34–5–0 which was from the Bekal and Kasaragod Fishermen Co-operative societies. Of this amount the Bekal Fishermen Co-operative Society has paid Rs. 10 since the close of the year leaving Rs. 9–5–0 and the Kasaragod Fishermen Co-operative Society has paid the entire amount, viz., Rs. 15.

265. *Loans to members.*—During the year Rs. 5,654–2–0 was collected from members and Rs. 4,126–5–0 was disbursed as loans to members leaving Rs. 32,834–5–0 outstanding against members,

as against Rs. 34,362–2–0 outstanding at the beginning of the year. The loans were issued for the following purposes :—

	RS. A. P.
Liquidation of prior debts	2,003 0 0
Trade	548 13 0
Other purposes	1,574 8 0

Of this amount Rs. 22,362–10–0 was overdue against Rs. 17,374 overdue at the beginning of the year. A good number of overdue loans are covered by decrees. There are a few time-barred loans also. These will be secured during the current year. Catches of fish were not satisfactory in some of the fishing centres during the past fishing season. Prices too were low. Yet it was possible for the borrowers to pay more towards their dues. Systematic and continued efforts will be made to collect the overdues. Unless absolutely necessary coercive steps will not be taken to enforce payments.

266. INVESTMENTS—*Reserve Fund.*—Rupees 3,508–5–0 out of a total reserve fund of Rs. 9,136–2–0 has been separately invested in the Central Bank. Of this amount Rs. 155–14–0 was invested during this year. As most of the societies are working without borrowing from the financing bank, they may perhaps be allowed to utilize the reserve funds without being compelled to invest them in the financing bank.

267. Of the 15 societies, nine are affiliated to the local Central Bank and they have invested in all Rs. 395 in the shares of that Bank. The Kaipunjal Mogers' Co-operative Society has applied for affiliation during this year and it has remitted Rs. 10 the value of a share on 25th July 1938. Nine of the societies had Rs. 863–12–0 on 30th June 1938 in their savings bank accounts.

268. *By-laws.*—Model by-laws drafted for the co-operative societies of fisherfolk and approved by the Registrar in the year 1936 which provide for the issue for urgent loans for purchasing salt and fresh fish, for collecting fish from members for sale, for issuing loans for erecting fish-curing sheds, etc., and for issuing long-term loans on the mortgage of immovable properties, etc., have been adopted in eight societies up till now. They will be introduced in the remaining societies during the current year. If the members take advantage of these facilities they can surely improve their economic condition and free themselves from their middlemen creditors (" Mudalalies ").

269. *Non-credit work.*—During the year in the Kasaragod Fishermen Co-operative Society, a total of 3,647 cured cat fish of a big variety was collected from 35 members and sold for Rupees

471-11-0. The sale price worked out at Rs. 12-13-6 per 100. Coolie charges incured including drying charges was Rs. 3-3-6. The balance amount of sale-proceeds, viz., Rs. 468-7-10, was credited against dues from the respective members in the society.

270. In Kizhur it is estimated that during the past fishing season, there was a total catch of about 70,000 big cat fish. This was divided equally among the 28 boat-owners. Most of them are members of the Kizhur Fishermen Co-operative Society. Owing to the absence of a yard they had to deliver their catches to middle-men (Mudalalies) most of whom are ticket-holders in the Kasaragod fish-curing yard. The Kizhur Fishermen Co-operative Society has petitioned for the reopening of the yard which was closed. The matter is under consideration.

271. (*b*) MALABAR.—At the beginning of the year there were 35 societies. The registration of the Kundazhiyur Arayajana Society was cancelled on 15th September 1937 and that of Vellayil Kada-puram on 27th October 1937. Thus at the end of the year the number of societies was only 33. A society for the fishermen of Cannanore was organized during the year but it is pending registration.

272. *Membership and paid-up share capital.*—In the 35 societies that existed at the beginning of the year there were 1,491 members with a paid-up share capital of Rs. 27,272-8-0. In the 33 societies remaining at the end of the year Rs. 623-3-0 was collected towards share capital and Rs. 2,609-5-0 paid off. At the end of the year, the number of members in the 33 societies was 1,310 with a paid-up share capital of Rs. 21,433-4-0. The reduction in the paid-up share capital and decrease in the number of members is due to the cancellation of two societies and to the removal from the rolls of defaulters and deceased members.

273. *Deposits and borrowings.*—During the year fixed deposits amounting to Rs. 260 were received in the Kuriyadi Fishermen Co-operative Society. Of this amount Rs. 140 was from a member and Rs. 120 from a non-member. The entire amount was repaid before the close of the year.

274. The Blangad Purchase and Sale Society received a deposit of Rs. 225 from the President of the Society during the year and nothing was repaid. The total deposit with the society now amounts to Rs. 375 including Rs. 150 that existed at the beginning of the year.

275. None of the societies borrowed from the District Bank during the year. Rupees 494-2-0 was repaid during the year leaving a balance of Rs. 2,506-9-0 against Rs. 3,000-11-0 outstanding at

the beginning of the year. The entire amount was overdue. It is due from nine societies of the district. Interest amount overdue was Rs. 321. The Muzhappilangad Mogers' Co-operative Society paid Rs. 9 towards principal and 9 pies towards interest. It has thus cleared its overdue interest.

276. *Loans to members*.—The total amount of loans outstanding against the members in all the 33 societies together was Rs. 46,157–1–0 on 30th June 1937. Loans issued to members in these societies during the year amount to Rs. 9,612–3–0. The total repayments by the members towards principal come to Rs. 10,870–12–0. A sum of Rs. 44,898–8–0 is therefore outstanding against the members in all the societies together at the end of the year. Of this amount Rs. 29,521–9–0 was overdue against Rs. 34,217–14–0 overdue at the beginning of the year. Out of the loans issued in 1937–38, Rs. 7,444–3–0 was for liquidation of prior debts, Rs. 619 for trade purposes, Rs. 573–8–0 for industrial purposes and Rs. 272 for other purposes.

277. INVESTMENTS—*Reserve Fund*.—There is a total reserve fund of Rs. 19,170 in all the societies together. Of this Rs. 3,875–7–0 has been separately invested in the District Bank. The balance of Rs. 15,294–9–0 is still pending investment.

278. *Shares in the District Bank*.—There is a total paid-up share capital of Rs. 1,430 in the Malabar District Co-operative Bank to the credit of all the 27 societies that are affiliated to that Bank. Eighteen societies had Savings Bank accounts. The total amount under investment was Rs. 451–15–0 at the end of the year. The Madapalli Fish Curers' Society has invested Rs. 187–4–0 in buildings and the Thalayi Fish Curers' Society Rs. 800. The curing sheds in the Thalayi fish-curing yard are owned by the Thalayi Fish Curers' Co-operative Society.

279. The model by-laws approved by the Registrar in 1936 have been adopted in three of the societies.

280. *General*.—In the Madapalli Fish Curers' Society no non-credit work was done during the year. At Thalayi Rs. 30 worth of fish was purchased during the year and sold for Rs. 31. The registration of the Vellayil Kadapuram Society was cancelled on 27th October 1937 as its state of affairs was found to be very bad. The registration of the Kundazhiyur Arayajana Society was cancelled on 15th September 1937 for the same reason. Though an enquiry under section 38 of the Act was instituted into the unsatisfactory affairs of the Vadanapalli Arayajana and Blangad Arayajana Societies, it was subsequently proposed to revive their working by

more strenuous efforts. The Chentrapini Arayajana and Engadiyur Dheevarajana are two societies which are properly and satisfactorily worked by their office-bearers, who take pains to keep up the good standard throughout. The latter is an infant society with a very bright future. A few of the members of the Cannanore Women Curers' Co-operative Society and the Kuriyadi Arayajana Co-operative Society have been supplied with home safe boxes. This arrangement will be extended to other societies and deposits encouraged. The progress of collection of overdues, however, cannot be said to be satisfactory. Slack collection and the dormant state of the societies are partly due to the general indifference and lack of co-operation on the part of most of the office-bearers who are many of them ignorant of co-operative principles and ideals and partly due to the comparative failure of fish on the coast and the resultant poverty of fisherfolk, a vast majority of whom are living on the income from the sea. The condition of the societies has thus been adversely affected. In some of the societies again owing to the prevalence of strong factions, smooth-working has been rendered difficult and the peaceful progress of societies hampered. In spite of the above handicaps attempts are being made to revive the working of dormant societies by suitable methods. In absolutely necessary cases, coercive action is being taken against recalcitrant defaulters.

The Sub-Inspector of the Quilandy Fish-curing Yard is the ex officio Secretary of the Quilandy Fishermen Co-operative Society and the Sub-Inspector of the Cannanore Fish-curing Yard is the Manager of the Cannanore Women Fish Curers' Co-operative Society. Both these societies are progressing. The Cannanore Women Fish Curers' Co-operative Society consists wholly of women.

281. In the Kuriyadi Arayajana Co-operative Society five members borrowed in all Rs. 400 in the year 1935–36, 1936–37 and 1937–38 and purchased a boat each. From the income of these boats these borrowers have up to 30th June 1938 paid Rs. 178 towards principal and Rs. 94–5–9 towards interest. All these borrowers are those whose boats were attached and sold for other debts. These five boats are under mortgage to the society. The society has really benefited them.

282. (*c*) BLANGAD PURCHASE AND SALE SOCIETY—*Membership and share capital.*—There are 12 members on the rolls of the society with a total paid-up share capital of Rs. 348 on 30th June 1938. There was a collection of Rs. 29–4–0 towards share capital and a refund of Rs. 92 in the year under review. No new members were admitted though two withdrew from the society during the year.

283. *Deposits and borrowings.*—There are no borrowings from the District Co-operative Bank. A sum of Rs. 150 remained as deposit in the society at the beginning of the year. A further deposit of Rs. 225 was received during the year making the total Rs. 375 at the close of the year.

284. *Loans to members.*—No loans are issued to the members in this society.

285. (i) INVESTMENTS—*Reserve Fund.*—The total reserve fund of the society was Rs. 363 out of which Rs. 63-6-0 has been invested in the District Bank. Rupees 299-10-0 is pending investment.

(ii) *Shares in Bank.*—The society has not taken any shares in the District Co-operative Bank.

(iii) *Savings Bank Account.*—The society has not deposited any money in the Post Office Savings Bank. The society needs money occasionally for meeting urgent expenses in connexion with the purchase of boats, nets, etc., and sundry repairs charges to be incurred. Investment of the society on boats and nets was Rs. 1,390 at the end of the year.

286. *By-laws.*—There were no amendments to the by-laws during the year.

287. *General.*—The society belongs to the non-credit type. Loans are not therefore issued to the members of the society. There was a considerable fall in the volume of fishing operations conducted by the society during the year which is due to the general dearth of fish on the coast. The total quantity of fish caught in the year was 876 maunds, and the total sale-proceeds amounted to Rs. 752-7-0. A sum of Rs. 601-1-0 was paid as living wages to the members forming the crew and Rs. 75-11-0 was the society's share of sale-proceeds, while the balance amount available for distribution to the members forming the crew amounted to Rs. 75-11-0. The accounts are written up by the petty yard officer, Blangad, and they are neatly and systematically maintained.

288. A receipt and disbursement statement showing the transactions of the society for the year 1937-38 is furnished below:—

Receipts.	RS.	A.	P.	Disbursements.	RS.	A.	P.
Society's share of sale-proceeds.	75	11	0	Share capital	92	0	0
Fixed deposit ..	225	0	0	Cost of nets	175	0	0
Share capital ..	29	4	0	Interest	10	8	0
Opening balance ..	0	4	0	Contingencies ..	10	6	0
				Closing balance ..	42	5	0
Total ..	330	3	0	Total ..	330	3	0

289. (ii) EAST COAST.—All the co-operative societies are functioning although it is understood that the financial condition of some of them is by no means encouraging. Seven fishermen co-operative societies were granted lease of fishery rights in inland waters for varying terms during the year against five last year (vide paragraph 208 supra).

290. *Co-operation among sea fishermen.*—The Lawson's Bay Co-operative Society is working properly. The Registrar of Co-operative Societies, Madras, paid a visit to it during the year, appreciated its working, and desired that the Deputy Registrar should see the proprietor of the land on which the members live and persuade him to sink a well for drinking water.

291. A new society called the Edupur Fishermen Co-operative Society was registered by the Deputy Registrar, Vizagapatam, on 27th November 1937 and the same started work on 3rd January 1938. Edupur is the chief centre of the Kandras (Oriya fishermen) found in this province.

292. The proposal to start a society for the fishermen at Gangavaram is receiving the attention of the Co-operative Department and ere long it is likely to be registered.

293. The attempt to organize a co-operative society for installing and working a drier at Akkividu for prawn-curing has not yet materialized.

C. Other Socio-Economic Work.

294. (i) WEST COAST.—Owing to the economic depression prevailing among the fisherfolk on account of poor catches and low market prices, societies, associations and organizations intended for the amelioration of their condition are more or less in a dormant condition. But they are nevertheless existing though their sphere of work is reduced. The fishermen of Yermal have constructed during the year a fine permanent building for holding their communal meetings. They also propose to locate a school in that building. They have the intention of handing over the school to the Fisheries Department if a Fisheries school is to be opened there.

295. The Mappilla fishermen of Vellayil started a library and reading room on 9th February 1938 called " Vidyavinodini Vayanasala." The Nicholson Reading Room at Quilandy has ceased to work. The Araya Yuvàjana Library at Cannanore and the Reading Room at Madai have also not been functioning. Efforts will be made to revive them and to improve their condition. The people of Azhicode have subscribed from among themselves Rs. 400 and put up a foot bridge across the canal leading to fishermen quarters, fisheries school and the fish-curing yard. Of this amount about

Rs. 100 was subscribed by the local fishermen. A road from the public road as far as the bridge is also being laid out, the expenses being met by subscription.

296. Difficulties owing to lack of road facilities at Madai and Madapalli are keenly felt.

297. A reading room and library named after Rao Bahadur V. Govindan was started in the Puthenkadapuram fishing village exclusively for the fishermen of the locality.

298. *Unfair taxation.*—A complaint was received in June last from the fishermen of Amnavarathopulu of Uppunda village in the Coondapoor taluk complaining against illegal collections by the fish market contractor of Byndoor. The complaint was referred to the President of the Panchayat Board. He has warned the contractor and promised that if such illegal exactions continue, the Board would be compelled to cancel his contract.

299. (ii) EAST COAST.—Proposals have been submitted for the construction of roads and wells for fishing villages out of the Government of India grant for rural uplift, but they were dropped as the villagers were not willing to contribute one-third of the cost, one of the conditions of the grant.

300. The Edupur Tambara, an extensive backwater of the Ichapur taluk, had been fished from time immemorial by the Kandras of Edupur and other surrounding villages. The Panchayat Board in its desire to enhance the rentals bought over the right in the public auction held by the Tahsildar and sub-leased subsequently for an unduly large amount. The Sub-Collector, however, has agreed with the department in granting the lease permanently for an equitable rental to the Kandras themselves.

301. Some of the ryots who have been granted darkhast lands in the margin of the swamp have been obstructing the drainage channel through which the tides reach the swamp with their quota of migrating fish and this has caused loss to fishermen. The claims of the fishermen were unjustly set aside by the Subdivisional Magistrate of Chicacole. At the instance of Government a detailed enquiry was made which showed that the rights of the fishermen must prevail and an aqueduct has been suggested for conducting irrigation water over the drainage channel for cultivable lands. The Sub-Collector has also recommended the grant of compensation to the fishermen for loss sustained.

302. (iii) PROVISION OF MARKETING FACILITIES FOR CURERS.—In connexion with a marketing survey, the Assistant Marketing Officer, Madras, requested assistance and information. He visited the fish-curing yards at Bimlipatam and Pentakota as well as the

Dowlaishwaram shandy. The Petty Yard Officers, Bimlipatam, Pentakota and Uppada furnished him with statistics collected by the department and with all other information required by him.

VIII. PROPAGANDA.

A. Rural Pisciculture.

303. *Enquiries received and advice given.*—(1) An elaborate enquiry was received from Mrs. A. W. Harler, Old Nullatani, Munnar, Travancore, regarding stocking ponds with fish, their food, etc. Suitable advice and information were furnished.

(2) In connexion with the anti-guineaworm treatment of waters, Dr. S. Yellamandiah, an Ayurvedic doctor of Giddalur (Kurnool district), was supplied at a cost of 12 annas with one dozen *Barbus dorsalis* which is reported to be an enemy of the worm for preparing lantern slides for the Director of Public Health, Madras.

(3) The Manager, Agricultural Farm, Palur, reported that Etroplus introduced in the farm wells died. The water of the well was analysed at the King Institute and was found to be very deficient in dissolved oxygen. He was asked to treat the water with lime in the proportion of 1 to 2 grams per gallon which will help to eliminate the excess CO_2 and bi-carbonates.

(4) The Superintendent, the Servindia Agricultural and Industrial School, Mayanur, who proposes to start teaching pisciculture also in his school, wanted information for the purpose and asked for some Etroplus free of charge. The available literature on the subject were sent to him and he was informed that 100 Etroplus can be sent to him free, if their transport charges are borne by him.

(5) Advice was given to the Superintendent, Borstal School, Palamcottah, in rearing Catla in the school well.

(6) The Commissioner, Chidambaram Municipality, was advised after a joint inspection of the tanks with the Health Officer on the suitability of stocking the waters in the municipal area with larvicides and the possibility of breeding the larvicides in one of the ponds.

(7) The Technical Advisor, Cutch State, was furnished with a note on *Megalops cyrunoides* and on the feasibility of stocking the State waters with Catla, etc.

(8) Sri Seshadri Ayyangar, a landlord of Negapatam, was given particulars of cost, etc., for supply of mosquito eating fish (Gambusia) and of Catla for demonstration purposes.

(9) The Director of the Department of Rural Reconstruction of the Andhra Christian College, Guntur, was supplied with particulars about rearing Gourami and Catla in small village ponds.

(10) The Commissioner, Hospet Municipality, was given advice on the rearing of larvicidal fish and of Catla and Gourami.

(11) All assistance possible was given to the Superintendent of the Zoo, People's Park, Madras, in starting an Aquarium in the Zoo. He was supplied with larvicides and two specimens of live Gourami for his Aquarium.

(12) On a request made by the East Indian Distilleries and Sugar Factories, Limited, Nellikuppam, their factory tank was inspected and advice to stock it with suitable fish was given.

(13) An estimate of cost for supplying larvicidal fish for stocking the municipal tanks and wells of the Conjeeveram Municipality was furnished to the Commissioner of the municipality. The trustee of the Sri Devarajaswami Devasthanam, Conjeeveram, complained that in the temple tank which is about 180 feet by 240 feet no fish thrive and wanted advice. On analysis the water was found to have no trace of dissolved oxygen and he was told the tank is not therefore suitable for any fish culture.

(14) The Deputy Director of Agriculture, Hyderabad State, reported that great difficulty was being experienced in catching fish in the Nizamnagar reservoir (about 55 square miles in area), and asked for advice as to the best methods of catching fish in it. He was informed that in Mopad where the department has initiated experiments in deep-water fishing drift nets have been found quite suitable, and was referred to the Administration Report of the Department since 1927–28 for details.

(15) Advice was given to Mr. J. N. Borooah, retired Judge, Gauhati, Assam, regarding stocking tanks with fish and the printed departmental leaflets were sent to him.

(16) At the request of the Director of Fisheries, Baroda, five tin carriers and five double tin carriers were supplied to him.

(17) Mr. A. V. James, Public Works Department Officer, Thuckalay, Travancore, wanted to know what kind of fish can be stocked in his new pond at Palamcottah (28 feet by 3 feet) plastered with cement, and whether the department will supply the fish. He was told that a cement tank will be hot for the fish and he was asked to deepen his tank to 6 feet and plant shade trees and weeds, and allow time for the water to settle, when the supply of required fish would be made to him.

(18) At the request of the President of the Panchayat Board, Kalingamatti, Tiruvengidam P.O., the Periakulam tank about 230 acres in extent was inspected. Stocking the tank with Catla and fishing the tank with drift nets as in Mopad has been suggested.

B. Exhibition.

304. The department participated in the following exhibitions :—

(i) The Fifth All-India Khadi and Swadeshi Exhibition, Salem (1st to 15th August 1937).

(ii) The Cuddapah District Exhibition and Cattle Fair, Proddatur (5th to 14th October 1937).

(iii) The South Kanara District Political Conference Exhibition, Mulki (25th December 1937).

(iv) The Khaddar and Swadeshi Exhibition, Tuticorin (19th December 1937 to 31st January 1938).

(v) The All-India Khadi and Swadeshi Exhibition (Madras Congress House) (19th December 1937 to 15th January 1938).

(vi) The Maharaja's College Third Science Exhibition, Vizianagram (28th and 29th January 1938).

(vii) The Sixth Annual Khadi and Swadeshi Exhibition, Narasapur (9th to 17th February 1938).

(viii) The Agricultural Exhibition, Ongole, Nellore (6th to 12th March 1938).

(ix) The Second Fine Arts and Industrial Exhibition and Fair, Tellicherry (7th to 18th March 1938).

(x) The Agricultural Exhibition, Narthamalai (8th April 1938).

(xi) The All-India Exhibition of Arts, Crafts, Industries, Agriculture, etc., Chittoor (10th to 19th April 1938).

(xii) The Agricultural and Industrial Exhibition, Tiruppur, during the Cattle Fair and Pony Show (12th to 14th June 1938).

Specimens of live food fish, museum specimens, cases of molluscs and crustacea of educational value, shell-grit for poultry and the Tanur products were exhibited. Advertisements regarding shell-grit and museum specimens, Tanur products, etc., were also inserted in the Agricultural Villagers' Calendar for the year as usual.

305. Gold medal certificates were received from Salem, Madras and Tiruppur Exhibitions.

IX. FISHERY LEGISLATION.

306. (i) LICENCES FOR FIXED ENGINES.—Sixty-one free licences were issued to fishermen for placing 123 submerged trees in the Palk Strait for catching fish, against 70 last year.

307. (ii) STAKE-NET FISHING.—The system of issuing licences for stake-net fishing in the Valarpatnam and Taliparamba rivers continues. On a report from the Adikari of Matool Amsam that some of the licensees failed to put up red lights on the caution posts at night, the Tahsildar, Chirakkal taluk, recommended the non-renewal of their licences. But since the Revenue Department failed to prosecute those who violated the conditions of the licence, the licences were renewed.

308. (iii) NILGIRI FISHING RULES.—Rules regulating fishing in the waters controlled by the Director of Fisheries were amended and published by Government in G.O. Ms. No. 2769, Development, dated 13th December 1937.

X. PUBLICATIONS.

309. FISH STATISTICS.—The statistics of landings on the West Coast for the years 1928–29 to 1930–31 are still in the press and will be issued in bulletin form shortly. Some of the statements for the years 1931–32 to 1933–34 have been scrutinized and the remaining statements have been received and are under scrutiny. Statements relating to the statistics for the years 1934–35 and 1935–36 have been compiled; these remain to be scrutinized.

310. As regards the East Coast yards they are spread over a very extensive area and till recently were in charge of peons. With the appointment of S.S.L.C. men as petty yard officers, the compilation of statistics for the East Coast though difficult has been started in earnest. A detailed census of fishing hamlets along the East Coast, their population, number of boats and nets are being collected.

311. BULLETIN ON FISHING METHODS.—Mr. Hornell's report on the Fishing Methods of the Madras Presidency, Part II—Malabar Coast, is still in the press.

312. BULLETIN ON MARKETABLE FISHES.—Further progress was made in the collection and identification of specimens from various localities.

313. REVISION OF FISHERIES MANUAL, PART I.—The revised edition of the Manual was printed and has been distributed to the staff.

314. PAPERS CONTRIBUTED TO THE SCIENCE CONGRESS.—During the recent Jubilee session of the Science Congress I was invited to contribute two papers entitled (1) "Fisheries and the Problem of Food Supply in India"; and (2) "Ecological Research with particular reference to Indian Fisheries."

PART II.

FINANCE.

315. *Summary of financial results.*—The total revenue for the year was Rs. 4,48,318 as against Rs. 4,23,043 last year. The increase was mainly from Pearl and Chank Fisheries due to the disposal during the year of the 1936–37 season catch, from Inland Fisheries on account of better rentals realised and from the Aquarium where the receipts amounted to Rs. 12,211, the highest on record. The Zoological Supply Section at Ennur and the Oyster Farm also are partly responsible for the increase in receipts. Sea fisheries were less favourable than last year both on the west and east coasts except for a slight improvement in the Northern Circars, resulting in a decrease in the net revenue from Rs. 48,048 in 1936–37 to Rs. 34,108 from fish-curing yards.

316. The total expenditure of the department was Rs. 5,76,197 against Rs. 5,84,007 in 1936–37. The decrease is due to the reduction in the quantity of salt purchased and transported to the West Coast yards.

317. The statement showing the total expenditure and revenue of the department is appended to the report (Appendix III). The rest of the statements are submitted in manuscript.

PART III.

STAFF AND EQUIPMENT.

I. BIOLOGICAL.

318. I was on long leave till 1st October 1937 and Dr. F. H. Gravely, D.SC., temporary Director of Fisheries, continued to act for me.

A. Assistant Director (Biology).

319. Dr. F. H. Gravely held additional charge of the office of the Assistant Director (Biology) till 1st October 1937 and I till 9th November 1937. From 10th November 1937 to 9th January 1938, Dr. D. D. Dasen, M.A., PH.D., was appointed to act as Assistant Director (Biology). On 10th January 1938, Dr. D. W. Devanesan rejoined duty as Assistant Director (Biology). He was appointed full member in category II of the Madras Fisheries Service with effect from 6th January 1936 (G.O. Ms. No. 1228, Development, dated 1st June 1937).

B. Research Stations.

320. Mr. Peter Devadoss continued as Research Assistant, Krusadai Biological station, till 12th October 1937 when he was granted leave for six weeks. On the expiry of his leave he was appointed

to act as Assistant Director, Pearl and Chank Fisheries, Tuticorin, with effect from 28th November 1937 and Sri S. Varadarajan was appointed to act as Research Assistant, Krusadai Island, from 9th November 1937.

321. *Buildings.*—With the construction of the eastern verandah this year, the entire building except the two bath rooms have been provided with a ferro-concrete roof. The barometer has been installed, but owing to certain defects it has developed, the readings are not accurate. The Inspector of Barometers, Poona Observatory, will be addressed to examine the barometer when he tours South India.

322. Mr. V. John continued as Research Assistant in charge of the West Hill Biological Station throughout the year.

II. TECHNOLOGICAL.

Tanur Experimental Station.

323. Sri V. P. Ananthanarayanan continued as Research Assistant of the Tanur station throughout the year except for a period of one and a half months from 2nd January 1938 when he was on leave. Sri V. Raghavan, an outsider, acted as Research Assistant for twelve days from 5th February 1938.

III. EDUCATIONAL.

324. (i) FISHERY ELEMENTARY SCHOOLS.—The number of teachers employed in Fishery elementary schools at the beginning of the year was 148 and at the close of the year, 166. Of these 22 were secondary trained, 19 of them being those trained in the Fisheries Training Institute, 126 were of the higher elementary grade, of whom 14 were ordinary trained, 111 fisheries trained, and one untrained and 18 of the lower elementary grade of whom 3 were ordinary trained, 12 fisheries trained and the remaining 3 untrained.

325. *Accommodation.*—In the South Kanara district two schools are housed in permanent Government buildings and three in semi-permanent Government buildings. Two schools are housed free of rent in permanent buildings owned by the fishermen of the locality. Eight schools are housed in rented permanent buildings, one in a rented semi-permanent building and the remaining one in a rented temporary building.

In the Malabar district lands have been acquired for the location of the Kadavanad and Talikulam schools and the extension of Kuriyadi school and have been taken charge of by the department. Government have sanctioned the acquisition of lands for the extension of Parapanangadi and Blangad schools, and acquisition proceedings are in progress. Plans and estimates for the reconstruction of the

Pudiappa school have been sanctioned. The acquisition of the present Palapatti school building and site and construction of an additional block for the same have also been sanctioned. The acquisition of building and site of the present Kottakadapuram school is not yet completed. The schools at Puduponnani and Kaipamangalam require additional accommodation on account of increasing strength. Proposals will be submitted for the same.

326. The proposal for a well for the Vellayil school is under consideration. A well and a urinal are necessary for the Parapanangadi school and this will be constructed when the site is acquired.

327. A cyclone on the night of the 2nd April wrecked the masonry pillars of the Kadalundi school building which were re-built.

328. (ii) CO-OPERATIVE SOCIETIES.—Sri K. Sankara Menon, Inspector of Co-operative Societies, continued to work throughout the year, and Sri P. Kannan Nayar, the other Inspector, till 6th April 1938 when he went on leave and Sri U. Parameswara acted for him.

IV. NAUTICAL.

(i) "Lady Nicholson."

329. This vessel was employed for the inspection of pearl banks as in previous years, when the full complement of the crew were *entertained.*

(ii) "Sea Scout."

330. The vessel was employed in routine chank fishery operations. The water cooling exhaust pipe gave way and had to be renewed at a cost of Rs. 180. The Magneto of the engine was also renewed at a cost of Rs. 215.

(iii) "Leverett."

331. The two cylinders of the engine in this vessel were renewed at a cost of Rs. 490. The boat was used in routine Pearl and Chank fishery work as usual.

(iv) "Pearl."

332. This boat is working at the Biological station, Krusadai Island. When the vessel is actually used in research work by visitors, propulsion charges alone are collected. This help is greatly appreciated by the visitors.

(v) Yorkshire Coble 'Pinctada.'

333. This has been transferred from West Hill to Metur for patrol of the reservoir, pending construction of a boat. As suspected, the vessel is not powerful enough to withstand the strong currents in the upper reaches of the lake.

V. ADMINISTRATIVE.

A. Director's Office.

334. Dr. F. H. Gravely continued to act as Director of Fisheries till 30th September 1937, when I rejoined duty after long leave. Sri C. R. Natesa Pillai was confirmed as Personal Assistant with effect from 6th January 1936.

335. *Inland Fisheries, Nilgiris.*—Sri E. K. Madhavan rejoined duty as Inspector of Fisheries after the expiry of his leave on 15th September 1937 till which date Sri Unni Nayar acted for him.

The Inspector's office was shifted to the newly allotted rooms in the Old European Jail building, Ootacamund, where facilities for research were provided.

B. East Coast (Northern Section.)

336. Mr. S. T. Moses having been appointed as Director of Fisheries, Baroda State, Sri T. P. Baratan was appointed to act for him. He took charge of the station on 2nd September 1937. He took leave on 12th May 1938 and Sri T. S. Ramalinga Mudaliyar is acting as Inspector.

C. East Coast (Central Section.)

337. Sri Jayaram Nayudu continued as Assistant Director till 14th January 1938, when his probation in category II of the Madras Fisheries service was terminated. Dr. D. D. Dasen, M.A., PH.D., was appointed as acting Assistant Director of Fisheries (Inland) and he took charge on 15th January 1938.

Sri S. Varadarajan acted as Inspector of Fisheries (Inland) till 2nd November 1937, Sri T. S. Ramalinga Mudaliyar from 10th December 1937 to 8th May 1938, and Sri K. K. Chidambaram from 9th May 1938 to the end of the year.

D. East Coast (Southern Section.)

338. Dr. M. Ramaswami Nayudu who was acting as Assistant Director was relieved on 22nd November 1937 to join his appointment as Fishery Expert to the Government of Bengal and Mr. Peter Devadoss who was selected by the Public Service Commission was appointed to act as Assistant Director on 28th November 1937.

339. Sri A. Somayaji, the temporary Inspector, continued as such till 1st May 1938 when he went on leave and Sri K. U. Nayar took his place from 15th May 1938. The further retention of the post of the temporary Inspector for another year from 1st April 1938 was sanctioned in G.O. No. 551, Development, dated 4th March 1938.

E. West Coast.

340. Sri U. Karunakara Menon continued as Assistant Director throughout the year.

341. Sri K. Ambady was in charge of the Mangalore section as Inspector of Fisheries, from 1st to 24th July 1937, K. Gopalan Nayar from 25th July to 4th November 1937, and U. Nagappa from 5th November 1937 to the close of the year. In the Calicut section, Sri T. P. Baratan was Inspector till 25th August 1937 when he was transferred as Inspector of Fisheries, Vizagapatam, and Sri A. M. Achuthan acted as Inspector till 1st November 1937 and Sri K. Gopalan Nayar from 8th November 1937 till the close of the year. In the Chowghat section, Sri U. Nagappa continued as Inspector till 2nd August 1937 when Sri K. Ambady was appointed as Inspector. Sri Ambady was on four months leave from 4th November 1937 when Sri A. M. Achuthan acted for him. The services of Clerk, J. A. Muliyil, were dispensed with during the year, as his work and conduct were unsatisfactory.

342. The office of the Assistant Director of Fisheries (Coast) was shifted from a rented building to the Fisheries Training Institute buildings, which were vacant after the abolition of the Fisheries Training Institute.

343. *Fish-curing yards.*—The yards at Hungercutta and Udayavar which under the reorganization scheme were put in charge of petty yard officers, were converted as Sub-Inspector yards during the year under report.

I have the honour to be,

Sir,

Your most obedient servant,

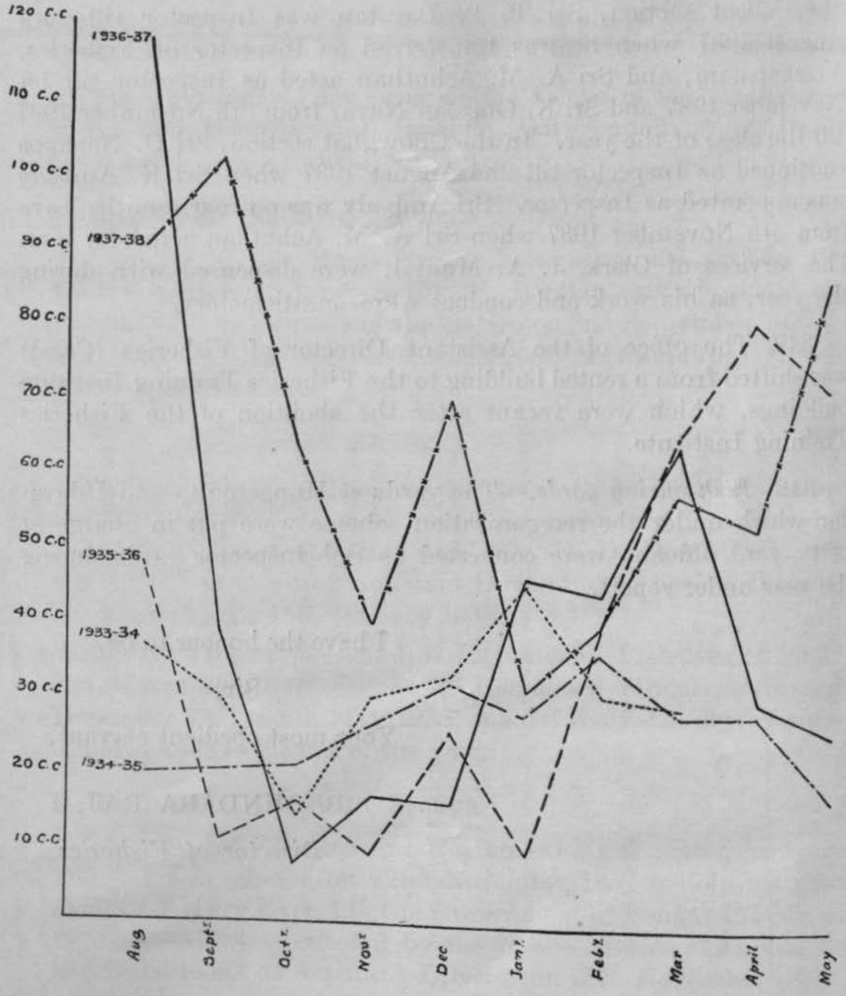
B. SUNDARA RAJ,

Director of Fisheries.

[Appendices

APPENDIX I

Graph representing the Quantitative analysis of Plankton for the Quinquennium ending with 1937-38.



APPENDIX II

Chank-marking Experiments.

Particulars of marked chanks refished during the year.

Serial number.	Number of shells recovered.	Date of liberation and recovery. Date of liberation.	Date of recovery.	Interval. Y.	M.	D.	Beds. In which the shell was liberated.	From which recovered.	Distance travelled. MILES.	Growth. In length. When liberated. M.M.	When recovered. M.M.	In diameter. When liberated. M.M.	When recovered. M.M.	Rate of growth per month. Length. M.M.	Diameter. M.M.	Remarks.
1	D. 506	27th Jan. 1936 ..	22nd Jan. 1938 ..	1	11	26	Melakilathi ..	Athombathu ..	3	110	116	54	58	0·25	0·17	Not returned.
2	D. 555	30th Jan. 1936 ..	22nd Dec. 1937 ..	1	10	22	Siluvai Par ..	Siluvai Par ..	1	111	113	56	59	0·08	0·13	Do.
3	D. 563	Do. ..	Do. ..	1	10	22	Do. ..	Do. ..	1	107	108	53	54	0·04	0·04	Returned.
4	D. 566	Do. ..	Do. ..	1	10	22	Do. ..	Do. ..	1	105	109	54	56	0·17	0·08	Do.
5	D. 639	13th Mar. 1936 ..	5th Apr. 1938 ..	2	0	23	Vadaithundam ..	Athombathu ..	5	95	108	50	56	0·53	0·24	Not returned.
6	D. 671	19th Mar. 1936 ..	15th Mar. 1938 ..	1	11	24	Melakilathi ..	Melakilathi ..	1	99	112	53	60	0·55	0·29	Returned.
7	D. 705	Do. ..	8th Feb. 1938 ..	1	10	20	Do. ..	Athombathu ..	3	100	101	52	56	0·04	0·16	Not returned.
8	D. 720	21st Mar. 1936 ..	Do. ..	1	10	18	Pudu Par ..	Melakilathi ..	3	99	114	51	56	0·67	0·14	Returned.
9	D. 726	Do. ..	3rd Mar. 1938 ..	1	11	10	Do. ..	Pudu Par ..	½	104	110	52	58	0·26	0·21	Not returned.
10	D. 737	Do. ..	Do. ..	1	11	10	Do. ..	Do. ..	½	100	107	48	55	0·30	0·30	Do.
11	D. 755	Do. ..	24th Apr. 1938 ..	2	1	4	Do. ..	Janathu Par ..	3	91	112	45	58	0·84	0·52	Returned.
12	D. 753	Do. ..	3rd Mar. 1938 ..	1	11	10	Do. ..	Pudu Par ..	½	101	112	53	56	0·47	0·13	Do.
13	D. 756	Do. ..	Do. ..	1	11	10	Do. ..	Do. ..	½	116	123	54	63	0·26	0·39	Do.
14	D. 767	25th Mar. 1936 ..	4th Apr. 1938 ..	2	0	10	Melonbathu ..	Erru Ettu ..	5	100	113	50	64	0·53	0·58	Not returned.
15	D. 769	Do. ..	12th Feb. 1938 ..	1	10	18	Do. ..	Do. ..	5	103	118	50	58	0·65	0·36	Returned.
16	D. 793	Do. ..	Do. ..	1	10	18	Do. ..	Do. ..	5	109	128	55	65	0·84	0·44	Not returned.
17	D. 857	30th Apr. 1936 ..	16th Dec. 1937 ..	1	7	16	Athombathu ..	Athombathu ..	1	101	121	52	64	1·02	0·61	Do.
18	D. 858	Do. ..	Do. ..	1	7	16	Do. ..	Do. ..	1	110	130	53	66	1·02	0·66	Do.
19	D. 875	Do. ..	Do. ..	1	7	16	Do. ..	Do. ..	1	108	124	56	63	0·76	0·33	Do.
20	D. 876	Do. ..	8th Feb. 1938 ..	1	9	9	Do. ..	Do. ..	1	105	115	57	59	0·47	0·09	Returned.
21	D. 886	Do. ..	5th Apr. 1938 ..	1	11	6	Do. ..	Do. ..	½	100	118	49	59	0·78	0·43	Do.
22	D. 895	7th May 1936 ..	18th Jan. 1938 ..	1	8	11	Erru Ettu ..	Aluwa Par ..	5	103	113	50	59	0·48	0·44	Not returned.
23	D. 899	Do. ..	Do. ..	1	8	11	Do. ..	Do. ..	3	102	112	52	58	0·48	0·29	Returned.
24	D. 920	Do. ..	Do. ..	1	8	11	Do. ..	Do. ..	5	106	118	51	59	0·58	0·39.	Not returned.
25	D. 941	9th Dec. 1936 ..	22nd Jan. 1938 ..	1	1	13	Do. ..	Athombathu ..	3	109	118	56	59	0·68	0·22	Returned.
26	E. 67	8th Mar. 1937 ..	16th Mar. 1938 ..	1	0	8	Neelankal ..	Seltan Par ..	3	106	110	55	58	0·33	0·26	Do.
27	E. 229	6th Apr. 1937 ..	18th Apr. 1938 ..	1	0	12	Kuthadiar Pathu.	Athompathu ..	3	102	112	55	58	0·81	0·25	Do.

APPENDIX III

Statement of Expenditure and Revenue of the Fisheries department for the Fisheries year 1937–38.

Sections.	Expenditure.			Revenue.			Difference.		
	RS.	A.	P.	RS.	A.	P.	RS.	A.	P.
A. Direction	42,160	13	7	3	10	9	— 42,157	2	10
B. Pearl and Chank Fisheries.	64,985	7	2	83,161	15	5	18,176	8	3
C. 1. Fishing Experiments.	988	7	5	..			— 988	7	5
2. Assistant Director (Coast).	13,113	10	7	35	5	0	— 13,078	5	7
D. Tanur Station ..	7,541	5	7	2,709	12	0	— 4,831	9	7
E. Training Institute, Calicut.	3,272	7	11	1	1	0	— 3,271	6	11
F. Fisheries Schools ..	74,412	14	2	112	11	0	— 74,300	3	2
G. Assistant Director (Inland).	1,01,226	10	6	82,782	15	5	— 18,443	11	1
The Nilgiri Fisheries.	12,107	7	5	7,137	2	0	— 4,970	5	5
Palni Hills Fisheries.	184	0	0	184	0	0	..		
H. Oyster Farm ..	1,579	6	0	2,421	13	0	842	7	0
J. 1. Marine Biological Section—									
Zoological Supply Section, Ennur.	6,040	9	0	3,275	9	0	— 2,765	0	0
Research Station, West Hill.	13,284	15	10	62	6	4	— 13,222	9	6
Research Station, Kurusadai Island.	8,404	13	5	787	13	6	— 7,616	15	11
J. 2. Aquarium	7,571	9	3	12,211	5	6	4,639	12	3
K. Fish-curing yards ..	2,19,322	7	1	2,53,430	2	4	34,107	11	3
Total ..	5,76,197	0	11	4,48,317	10	3	— 1,27,879	6	8

Government of Madras

DEVELOPMENT DEPARTMENT

G.O. No. 3139, 19th December 1938

Fisheries—Administration report—1937-38—Recorded with remarks.

READ—the following paper :—

From the Director of Fisheries, dated 31st October 1938, No. 1952-G/38.

Order—No. 3139, Development, dated 19th December 1938.

Recorded.

2. The fishing season on both the East and West Coasts during the year under review was worse than in the previous year. Oil sardine were unfortunately again scarce while the mackerel fishery was a failure. Researches on oil sardine and mackerel were however continued at the Biological Station at Calicut in regard to their spawning season and stomach contents. Pearl Fishery research at the Krusadai Pearl Farm received a great impetus from the discovery of unexpected spat falls in very shallow water adjacent to the farm in places where oyster beds have never been known before. These oysters are being fished and added to the farm and this large addition, it is hoped, will enable the department to commence pearl farming on an extensive scale and provide sufficient raw material for initiating experiments in the culture-pearl industry. The Plankton investigation was continued as usual both at the Krusadai and West Hill Biological Stations. There were no deep sea-fishing experiments, but proposals for reviving them are under consideration. In the field of technological research, useful work was carried on at the Tanur Research Station. The vitamin 'A' survey of fish oils has led to the discovery of four more Indian fish with three to nineteen times the vitamin potency of cod liver oil. Another notable result achieved during the year is the confirmation of the presence of vitamin 'A' in appreciable proportions in Malabar sardine oil. A scheme to popularize the manufacture of medicinal fish oil in fishing villages as a cottage industry is under consideration. The scheme for

advanced research on fish manure has been held up, as funds have not yet been allotted by the Imperial Council of Agricultural Research. There were 100 fish-curing yards working in the year, 49 on the East and 51 on the West Coast. The expenditure and revenue as well as net profit showed a fall as compared with last year. The chank fishery operations were conducted on the usual lines and the financial results were more encouraging than those of last year. It is gratifying to note that the year under report was a record one for gate collections at the Marine Aquarium which continues to attract a large number of visitors.

3. The inland fisheries yielded an appreciable increase in revenue over that of the previous year, the Cauvery rentals alone bringing in an increase of nearly Rs. 4,000. The usual stocking operations were continued in the inland waters. The most important feature of the year in inland fishery research is the proof obtained of the breeding of catla in the Cauvery river and its capacity to be able to live or breed in rapid currents in large rivers. The chief cause for the failure of catla and gourami to thrive in the Ippur farm has also been traced to the sub-soil salinity which supervenes in late summer.

4. The department continues to labour for the mental and moral improvement of the fisherfolk and the work consists mainly of the conduct of special elementary schools for the children of fishermen and of the organization of co-operative credit for the benefit of the community. The number of schools rose from 36 in 1933–34 to 42 during the year. The strength of the schools has risen by 30 per cent during the period and there was also satisfactory increase in the attendance of fisher children. The transactions of co-operative societies among the fisherfolk have not been very encouraging. There was a distinct decline in the operations of the fifteen societies in South Kanara. The share capital fell, collections decreased and overdues increased. The societies in Malabar fared no better. The number of societies was 33 against 35 in the previous year; membership and share capital also declined. The entire amount due to the Central Bank is overdue. The outstandings and overdues from the members show some decrease. The Director of Fisheries reports that the financial position of some of the East Coast societies is not encouraging. The progress of co-operation among the fishermen community has not been satisfactory, partly owing to the impecunious condition of the members and partly owing to non-realization of the benefits of the movement. The hope of successfully uplifting the members however lies only in co-operation and it is relieving to note the testimony of the Director that there is some awakening as to the value of co-operative institutions and his confidence that the scheme for vitalizing the movement among them recently drafted would greatly improve their economic condition.

5. The maintenance of this department has cost the Government nearly Rs. 1·28 lakhs in the year against Rs. 1·61 lakhs in 1936–37. The expenditure on fishery schools alone amounted to

Rs. 77,500 which is of course legitimately debitable to the Education budget. Deducting this amount the net cost of the department was only just over Rs. 50,000. When the reorganization of the department now under consideration is given effect to, it is hoped that it will be possible to reduce the net cost further.

(By order of His Excellency the Governor)

C. J. Paul,
Secretary to Government.

To the Director of Fisheries.
,, the Local Administration Department.
,, all Collectors.
,, the Board of Revenue.
,, the Collector of Salt Revenue.
,, the Commissioner of Labour.
,, the Chief Engineer (Irrigation).
,, the Registrar of Co-operative Societies.
,, the Director of Agriculture.
,, the Director of Industries.
,, the Accountant-General.
,, the Education and Public Health Department.
,, the Public Department.
,, the Finance Department.
,, the Director-General of Commercial Intelligence and Statistics (with C.L.).
,, the Government of India, Department of Commerce (with C.L.).
,, the Statistical Officer.
,, the Secretary, Madras Legislature.

Press.

AGENTS FOR THE SALE OF MADRAS GOVERNMENT PUBLICATIONS

IN INDIA

NEW BOOK CO., Booksellers, etc., 'Kitab Mahal,' 188-90, Hornby Road, Bombay.
D. B. TARAPOREVALA SONS & CO., Bombay.
THACKER & CO. (LTD.), Bombay.
N. S. WAGLE, Circulating Agent and Bookseller, No. 6, Tribhuvan Road, Girgaon, Bombay.
THE BOOK COMPANY, Calcutta.
BUTTERWORTH & CO. (LTD.), 6, Hastings Street, Calcutta.
R. CAMBRAY & CO., Calcutta.
THACKER, SPINK & CO., 3, Esplanade East, Calcutta.
K. KRISHNA AYYAR BROTHERS, Booksellers, Publishers, etc., The Round, Trichur (Cochin State).
THE CHRISTIAN LITERATURE SOCIETY FOR INDIA, Post Box No. 501, Park Town, Madras.
CITY BOOK COMPANY, Post Box No. 283, Madras.
C. COOMARASWAMY NAYUDU & SONS, 27 and 35, Chinnathambi Street, Madras.
HIGGINBOTHAMS (LTD.), Mount Road, Madras.
THE LAW PRINTING HOUSE, 11, Mount Road, Madras.
G. A. NATESAN & CO., Madras.
P. R. RAMA IYER & CO., No. 368, Esplanade Row, Madras.
P. VARADACHARI & CO., Booksellers, 8, Linga Chetti Street, Madras.
Agent, THE SOUTH INDIA SAIVA SIDDHANTHA WORKS PUBLISHING SOCIETY, LTD., 6, Coral Merchant Street, Madras.
VENKATRAMA & CO., Educational Publishers and Booksellers, Esplanade, Georgetown, Madras.
D. SRI KRISHNAMURTHI, Editor of "Grama Paripalana," Ongole (Madras).
E. M. GOPALAKRISHNA KONE, Pudumantapam, Madura (Madras).
NATIONAL WELFARE PUBLICITY, LTD., Mangalore (Madras).
M. SESHACHALAM & CO., Proprietors, The Hindu Press, Masulipatam (Madras).
THE HINDUSTAN PUBLISHING CO., LTD., Rajahmundry (Madras).
THE MODERN STORES, Salem (Madras).
The Proprietor, THE HOUSE OF KNOWLEDGE, Booksellers and Publishers, Palliagraharam P.O., Tanjore (Madras).
S. KRISHNASWAMI & CO., Teppakulam Post, Trichinopoly Fort (Madras).
L. VAIDYANATHA AYYAR, Law Bookseller, Teppakulam P.O., Trichinopoly (Madras).
A. VENKATASUBBAN, Law Bookseller, Vellore (Madras).
The Manager, THE INTERNATIONAL BOOK SERVICE, Booksellers, Publishers, News Agents and Stationers, Poona : 4.
P. N. SWAMINATHASIVAN & CO., Commission Agents, Booksellers, etc., Pudukkottai State.
The Proprietor, THE PUNJAB SANSKRIT BOOK DEPOT, Saidmitha Street, Lahore (Punjab).
MOHANLAL DOSSABHAI SHAH, Books Agent, etc., Rajkot.
B. S. MATHUR & CO., Chatur Vilas, Paota Civil Lines, Jodhpur (Rajputana).
THE BOOKLOVERS' RESORT, Booksellers and News Agents, Taikad, Trivandrum.

NOTICE

Official publications may be obtained in the United Kingdom either direct from the office of the High Commissioner for India, India House, Aldwych, London, W.C. 2, or through any bookseller.